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ORIGINAL MEMOIRS.

SPLENOPEXY FOR WANDERING SPLEEN.

WITH REPORT OF A CASE.

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WANDERING spleen is a rare condition, and the records of operations undertaken for its fixation can still be counted on the fingers. The considerable enlargement of the organ that is usually coexisting, and the free hæmorrhage which results if sutures are made to penetrate the parenchyma, have driven the surgeon to choose extirpation rather than attempt fixation in most of the cases that have been operated upon. Nevertheless, although the mortality of splenectomy for floating spleen has fallen during the last decade to something less than 10 per cent., this operation can scarcely be regarded as ideal treatment unless it is first demonstrated that fixation of the organ is impracticable.

On looking through the literature of the subject, I have only been able to find records of eight cases in which splenopexy has been performed for floating spleen. To these I would now add the following case.

E. G., a married woman, aged thirty years, was admitted into the Bradford Royal Infirmary under Dr. Campbell, who transferred her to the surgical wards under my care on November 20,

1901. She stated that she had been subject to bilious attacks since she was fourteen years of age. Up to her marriage at the age of twenty-three she had no other illness of note. She has had four children. The first labor was difficult and protracted, the child being stillborn. She has given birth to three children subsequently, labor in each case being normal. She has never been quite well, however, since the first confinement. After her accouchement she felt a constant dragging pain in her left side whenever she walked about. This has grown steadily worse for the past seven years. The pain has not been very acute in character, but "it made her sick," and she has been debarred from active life. Latterly, she has also had attacks of acute abdominal pain coming on suddenly, usually after some rapid movement, such as rising up or sitting down. During these attacks she is very faint, and a large, tender swelling can be felt in her abdomen. Relief is obtained by lying down. Since these attacks first called her attention to it, she can now always feel a large lump in the abdomen "which moves about."

Condition on Admission.—A healthy looking woman, rather thin, with bright eyes and rosy complexion. The abdominal wall is flaccid and shows well-marked lineæ albicantes. A firm, elongated tumor can be felt in the left hypochondrium, projecting below the costal margin and reaching nearly to the middle line at the umbilicus. It moves with respiration, and can be displaced by palpation in various directions. When the patient is standing it can be pushed almost into the right iliac fossa. The tumor is obviously an enlarged spleen; the firm edge, with a well-marked notch on the anterior border, being very evident. It is slightly tender on manipulation. There is no sign of any organic disease in the other organs of the body. The urine contains no albumen or sugar. The blood count gives no evidence of any abnormal condition. Diagnosis, floating spleen with secondary enlargement.

Operation.—On November 22, 1901, ether was administered, and the abdomen opened by an incision four inches long at the outer border of the left rectus abdominis. The lower pole of the spleen was exposed by this incision, and the whole organ was then delivered through it without much difficulty. It was seven and a half inches long and three and a half inches wide at its centre. Except for its size, it was to all appearances a normal spleen. At this stage it was evident that splenectomy could be easily accom-

plished. The pedicle was so long that the delivery through the incision had scarcely tightened it, and the arrangement of the vessels was such as to allow of easy separate ligation. Whilst considering the advisability of removal, however, it was noticed that the notch on the anterior border was only two to three inches from the lower extremity of the spleen, and the depth of the notch was such that the lower pole of the spleen was only connected to the rest of the organ by a comparatively narrow isthmus. This arrangement at once suggested an easy means of fixing the organ. The main body of the spleen was therefore replaced in the abdomen after rendering the parietal peritoneum raw in the splenic fossa in order to excite adhesions. Then, whilst the lower pole was held in the wound, the edges of the peritoneum were drawn tight by a purse-string suture until they closely gripped the narrow isthmus in the notch. The abdominal aponeurosis was next sutured in a similar manner until it grasped the isthmus in the notch sufficiently tightly to produce marked congestion of the now isolated lower pole. The left rectus muscle was next drawn outward somewhat, so as to overlap the projecting pole of the spleen as much as possible, and the skin incision sutured. After closing the skin incision, a prominent lump the size of half an orange remained.

There was no appreciable shock during or after the operation. The pulse quickened on delivering the spleen through the incision, but not to any alarming extent. For the first twenty-four hours after operation pain was severe, and required morphine for its relief. Two days later a small opening was made through the skin and a drainage tube inserted, as fluid was collecting in the dead space beneath the rectus muscle round the projecting spleen. After this, recovery was uneventful. At the end of a fortnight the lump in the abdominal wall was harder and had slightly diminished in size. The patient returned home at the end of a month. Three months after the operation there was a hard, flattened swelling to be felt in the abdominal wall. It was painless, and the spleen within the abdomen was firmly attached to it. So far as it was possible to determine, the spleen had shrunk, but the diminution in size was not very great. It could not be displaced by palpation nor by any change of posture. The patient was entirely relieved of her symptoms, and stated that she could now undertake her household duties or any active exertion. This satisfactory result has now been maintained for twelve months.

The means that have hitherto been adopted for obtaining fixation of a floating spleen are, broadly speaking, three in number, namely, the excitation of adhesions by tamponade, the formation of a pocket in the parietal peritoneum in which the lower end of the spleen is placed, and the use of sutures. To these may be added the method of Sykoff¹ which has been performed experimentally on dogs. Acting on the suggestion of Lewschin, Sykoff suspended the spleen in a catgut net. This method has not been attempted in man, where the conditions to be met, especially when the spleen is enlarged, are so totally different that the procedure seems scarcely likely to meet with success.

The origin of the operation of splenopexy is usually credited to Rydygier, but the first publication of two cases seems to have been made by Kouwer² in 1895, who opened the abdomen by a lumbar incision, fixing the spleen in it by means of tamponade. In his first case the result was good, but in the second the tamponade had to be removed on account of symptoms of ileus appearing.

In the same year Rydygier³ published a case in which he fixed the lower end of the spleen in a pocket in the parietal peritoneum. He opened the abdomen in the middle line and detached sufficient of the peritoneum from the left abdominal wall to hold half the spleen. Three months later the result remained satisfactory.

In the same year Pflücker⁴ also reported a case operated upon by Bardenheuer. Here the spleen was "dislocated" through a small peritoneal opening in the left flank and fixed by a silk suture to the tenth rib.

In 1896, Giordano⁵ reported a case. The spleen, which was four times its natural size, was fixed with sutures "high up between the diaphragm and abdominal wall" (?). The result was satisfactory.

In 1897, Greiffenhagen⁶ reported a case in which he secured fixation by passing two silk sutures through the parenchyma of the spleen and the muscles of the abdominal wall.

Fierce bleeding took place, which was controlled with difficulty. Seven months later the result was good.

In 1898, Franke⁷ published a case in which he placed the lower pole of the spleen in a pocket in the parietal peritoneum and fixed the pedicle by sutures to the abdominal wall.

In 1901, J. C. Warren⁸ reported a case operated upon by Balch. The spleen, which was very large, was extensively adherent to the pelvic brim. There had been previous attacks of peritonitis. After tedious stripping of adhesions, the spleen was pushed "as high up in the abdomen as possible." No suturing was done, but the subsequent reformation of adhesions was relied upon to secure fixation. The result was good.

I have included this case operated upon by Balch, although it is doubtful if it should be reckoned as a case of splenopexy. The subsequent fixation of the organ appears to have depended entirely upon the reformation of adhesions, and not upon any special operative technique designed for the purpose.

The method of fixation adopted in my own case differs from any of those previously resorted to in the principle of making use of the notch in the spleen as a means of fixation. When such a method is feasible, it undoubtedly secures a safe and easy anchorage of the organ. It is evident, however, that such a method cannot have a universal application, since the notch may be absent or so placed as to be useless for the purpose. Further operative experience alone can decide how often this method is applicable.

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URETHROPLASTY.

REMARKS ON THE REPAIR OF DEFECTS OF THE MALE URETHRA, WITH REPORT OF TWO CASES.¹

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THE ideal aim of all plastic surgery is the replacement of diseased or defective parts by tissues whose structure and function are similar to the healthy ones. Only exceptionally is a full realization of this ideal possible, the final result failing of it in one or the other condition.

The comparative merits of plastic operations are judged by the standard of the ideal, and in their use we should select such as most nearly satisfy its conditions. Only when the necessities of the situation demand is resort made to those methods that depart mostly from it.

In the male urethra, as in other parts, numerous methods for the repair of defects have been devised. To an endeavor to fix some broad indications for the employment of the special methods this contribution is devoted.

The male urethra is, roughly speaking, made up of three coats,—the mucosa, the submucosa, and the muscularis. It is surrounded in its anterior part by the cavernous body, and in its beginning by the prostate gland. The cavernous body is so intimately connected with the walls of the anterior portion of the canal that, for practical purposes, it should be considered as an integral part of it.

The submucosa, especially of the penile portion, contains a marked abundance of elastic fibres, which permits to this organ considerable distractibility; a most important attribute from the stand-point of plastic operations. In virtue of this

¹ Read before the Section of Genito-Urinary Diseases of the New York Academy of Medicine, December, 1902.

elasticity, the urethra can be stretched so as to supply a defect in its continuity between two and three centimetres. Naturally the penile portion enjoys a greater elasticity than do the fixed membranous and prostatic parts.

The urethra possesses another attribute which is of importance for plastic surgery upon it, viz., its power of almost complete regeneration from a stump which has been left behind. The excellent experiments of Ingianni (*Centralblatt für Chirurgie*, 1899, No. 6) upon the regenerative power of the urethra prove

(1) That the regeneration of smaller or larger portions of the urethra can be experimentally attained.

(2) That the parts of the urethra which regenerate are the mucosa and cavernous body; the muscularis takes no part in it.

(3) That the regeneration takes place from the stumps of the urethra.

(4) That a small stump of the urethra when it is implanted into one end of an artificial canal made under the skin will grow and gradually line the interior of the entire canal. In this way a new canal can be constructed which in structure and function approaches the normal, and which can replace the latter. Such a newly formed canal lacks only a muscularis.

These two attributes of the urethra, viz., its great elasticity and its power of almost complete regeneration from its stump, have an important practical bearing in the plastic work upon it.

Preliminary Considerations.—The successful issue of any form of urethral plastic operation is greatly dependent upon a healthy, sweet condition of the urine, a tolerance of the bladder and urethra for a permanent catheter, and strictest attention to asepsis and antisepsis. The internal administration of urotropine in doses of ten grains twice daily, or of one of the other urinary antiseptics, together with proper treatment of any pre-existing urethral and vesical inflammations, will serve to render the urine sweet and clear. The main causes of vesical and urethral intolerance to a permanent catheter are inflammatory states of the urethra and bladder and foul urine. The writer

has rarely seen intolerance when the urine was normal and the vesical and urethral mucosa in a healthy state. Irritable patients will complain of the pain and smarting from the presence of a foreign body in the canal, but such symptoms are readily relieved by morphine and bromides.

Types of plastic operations and indications for their application.

A. The elasticity of the urethral walls will at once suggest the method of mobilization of the stumps, stretching them until the ends meet, and uniting them in this position by end-to-end suture. By this method the defective parts are replaced with tissues of exactly similar structure and function, and thereby the ideal aim is achieved. It would therefore be the method of choice, with the following limitations:

(1) The defect must not be too large; never exceed three centimetres; usually two centimetres is the limit to which the ends of the urethra can be distracted.

(2) The urethral stumps must be mobilizable; not too firmly embedded in cicatricial tissue.

(3) The urethral stumps must not have been rendered brittle and inelastic by inflammatory processes.

Partial defects of one wall of the urethra would rarely be repaired by this method; for other types of operation are attended with less risks and give equally good results. The method finds its best application in complete or almost complete defects, not exceeding two to two and one-half centimetres in extent.

When union has occurred, which usually happens in well selected cases, the structural and functional results are perfect.

The dangers to be feared are sloughing of the stump ends from too much tension. Such excessive tension arises either from over-distracted or from incomplete immobilization. Infection either from urinary extravasation between the united ends, or as a direct result of the operation, does not jeopardize the final issue unless it is of a severe type; urinary fistulae resulting from such infection tend to close spontaneously.

In the performance of this operation, the parts are first

thoroughly freshened and cleaned. The urethral stumps are then well mobilized for several inches on each side of the defect and brought together. The ends are held in apposition by a row of fine catgut sutures, passed in Lembert fashion, and going through all the coats but the mucosa. The perineal soft parts are then united in close apposition over the newly formed canal by two rows of buried catgut sutures; the skin is united by fine silk. A permanent catheter is left in the urethra for seven days.

B. Restoration of defects, partial or complete, by regeneration from its ends (Guyon's operation). (Gaz. Hebd. de Médecine et de Chirurgie, No. 20, 1892.)

As such regeneration results in the formation of new walls, differing from the normal only in the absence of a muscular layer, the result approaches very nearly to the ideal. The lack of a muscular tunic would theoretically favor incomplete contraction of the walls of the canal with retention of a few drops of urine within the lumen and resulting decomposition and chronic urethritis. Practically this has not been noticed.

Hampered by none of the limitations of the foregoing method, and attended by practically no dangers of sloughing of the urethral ends, this method finds a much wider range of applicability. There are few contraindications to its employment. Chief of these are (a) extensive loss of substance of the soft parts overlying the urethra, or (b) extensive cicatrization of these tissues. Whereas the former method is chiefly applicable to small, complete, or nearly complete defects, this method may be employed equally well in complete or partial and small or very extensive ones. In its performance it is simple. The perineal tissues surrounding the defect are first thoroughly freshened and cleansed, and the ends of the urethral stumps freed from their surroundings. As large a soft catheter as the urethral canal will comfortably accommodate is then passed through the two separated parts of the canal into the bladder. Over this catheter the perineal tissues are approximated by two rows of buried fine chromicized catgut sutures, and the skin united with fine silk. The catheter remains in

situ for ten days, by which time regeneration has so far occurred as to insure success. After the catheter is removed, the patient is permitted to void his urine spontaneously. As in some patients the catheter is not well borne, or at all tolerated for ten days, it has been proposed to drain the bladder through a perineal opening behind the affected portion of the urethral canal. If the urine is sweet before operation, and the patient is kept well under morphine and bromides, it seems to the writer that very few instances of non-toleration for the catheter will be encountered. In the two cases of the writer, one of which was a child with clear urine, the other an adult with foul urine, no difficulties were encountered from this source. The milder grades of infection of the perineal wound are of no material consequence to the ultimate good result, and, as in the foregoing method, the perineal fistulæ that follow such infection close spontaneously.

C. Formation of a new canal by grafting skin or mucous membrane either from the immediate vicinity or from other parts of the body upon the site of the defect, and then uniting such grafts to the proximal and distal stumps of the urethral walls. This method has but a limited range of applicability.

The walls of the canal thus made differ radically from the normal ones, as they possess neither urethral mucosa, muscularis, cavernous tissue, or abundance of elastic tissue. Without the latter, erection of the penis is materially interfered with. A canal so constituted serves only as a channel to transmit the passage of urine and semen.

The operation is necessarily done in several sittings, and its successful result is consequently more uncertain than in the previous methods.

This type of plastic operation will find its application only where either of the others cannot be employed. Its procedure necessarily varies with the method of grafting that is employed. The underlying principle consists in grafting skin or mucous membrane into the defect between the urethral stumps, and when such graft has become adherent uniting it at either end to the urethra. The graft is then closed circularly over

a catheter passed into the bladder, and the overlying perineal soft parts approximated by several rows of buried sutures.

End Results of Plastic Operations.—Whatever the method employed, there seems to be but little tendency in the newly formed portion of the canal to contraction. In the writer's two cases, one of whom has been under observation for two years, there has been no contraction. It has been noticed in the child that the newly formed portion of the canal does not increase in caliber with the same rapidity as the other part. Thus, whereas at the time of operation a No. 10 French bougie was the largest size the anterior urethra could accommodate, a No. 12 French is easily passed to-day, but only a No. 11 French will pass through the perineal urethra.

The following two cases, operated upon by the writer during the summer of 1900, illustrate very well the value of Guyon's operation,—the reconstruction of the urethra by regeneration from its stumps.

CASE I.—S. F., ten years old, was admitted to the surgical service of Dr. Gerster at Mt. Sinai Hospital on August 14, 1900. Three days before he had fallen astride a beam, injuring his perineum. He was unable to urinate after the injury, catheterization being necessary. The next day a discolored swelling appeared in the perineum. This rapidly increased in size, spreading over the entire perineum, scrotum, penis, and pubic region. The following day he had several chills and high fever. The urine had to be withdrawn by catheter since the time of the accident.

On admission, the well-nourished, healthy boy presented the following physical signs. The perineum, scrotum, and penis were occupied by an oedematous, ecchymotic, fluctuating swelling which was gangrenous in patches. The ecchymosis extended well downward on the inner aspect of the thighs. The bladder was distended, reaching up to near the umbilicus. A catheter passed into the meatus, entered into a pouch in the perineum, from which several ounces of turbid decomposing urine were withdrawn. It was impossible to pass the catheter beyond the bulbous urethra. The child stated that his physician had introduced the catheter only to this point. Temperature, 104° F.; pulse, 120.

The child had sustained from the injury a rupture of the perineal urethra. He had voided his urine for three days through this rupture into the cellular tissue of the perineum, from which place it had been withdrawn by catheter. The urinary extravasation had spread over the scrotum, penis, and abdomen, and the perineal tissues had already become gangrenous.

Immediate perineal section was proceeded with. The deep perineal structures were found to be gangrenous and infiltrated with decomposed purulent urine. A tunnelled sound passed into the urethra through the meatus emerged into the perineum through a large rent in the bulbomembranous portion. The walls of the latter were gangrenous. After some search the distal end of the proximal portion of the lacerated urethra was found, and a catheter passed into the bladder, withdrawing clear urine. The catheter was left *in situ*. Numerous cutaneous incisions were then made in the perineum, scrotum, and pubic regions to let out the infiltrated urine. All the wounds were packed and a wet dressing applied.

The boy reacted well from the operation. The fever at once subsided. After several days the gangrenous tissues commenced to separate. Drainage of the bladder was discontinued on the seventh day, the boy voiding his urine through the perineum thereafter. A sound was daily passed through the anterior urethra and through the perineum into the bladder. On September 5 the wound was entirely covered by granulations. Examination showed the urethral ends to be separated one and one-half inches. There appeared to be no connection between the proximal and distal ends.

September 7. Urethroplasty ("Guyon").—The boy in the lithotomy position. The urethral ends were dissected free from the neighboring tissues. The defect in the urethra was found not to be a complete one, as a strip of mucous membrane one-eighth of an inch wide along the superior wall connected the two ends. A No. 5 soft rubber catheter was passed through the anterior urethra into the posterior urethra and bladder. At the site of the defect, the adjacent perineal soft parts, which had been thoroughly freshened, were closely united over the catheter by fine catgut sutures passed Lembert fashion. Over this the overlying perineal tissues were sutured with two rows of buried catgut sutures, and two final silkworm-gut sutures were passed

through the entire perineal tissues, to relieve tension. Catheter left *in situ* and a dry aseptic dressing applied. The bowels were ordered to be kept constipated for one week.

September 11. During the first four days after operation the boy felt very well; only moderate temperature elevations. During the night of September 11 he complained of great pain in the urethra. Examination showed that the catheter had been extruded about two inches. The house surgeon was unable to reinsert the catheter, and, as the child was in pain from retention of urine, he was given a hot enema. In expelling the enema he passed urine through the perineal wound. The next morning I was able to easily pass a No. 5 Mercier catheter into the bladder through the urethra. This was again left *in situ* and strapped in position.

September 14. Bowels moved by enema. Perineal stitches removed, and a new catheter inserted per urethram into the bladder.

16. Catheter removed: the patient urinated voluntarily through the meatus. Slight leakage through a small perineal fistula. Catheter left out.

18. The boy passed most of the urine through the perineal fistula. Permanent catheter replaced until the fistula should contract.

26. Catheter left out. Only a few drops of urine are passed through the perineum. Bougies Nos. 8 and 10 are passed daily.

April 1, 1902. A No. 11 French bougie passed very easily. Urine clear, stream of fairly good force. No flexion of penis. Still has a little difficulty in holding his urine, though he is much better in this respect than he was.

CASE II.—An adult male, A. K., admitted August 29, 1900. He had suffered with a urethral stricture for three years. The stenosis had become progressively worse, and for the past few months urination had been very difficult. During the latter period he had often passed considerable blood in the urine. For ten days prior to his admission, he had been able to pass only very small quantities of urine at a time, and this with very much straining. He also began to have pain in the perineum, pain with defecation, and a swelling appeared in the perineum. The pain and swelling gradually increased, and at the time of his admission to the hospital urination had become impossible. The patient had some fever, but no chills.

On admission, the poorly nourished man of forty-five years presented a red, painful, fluctuating swelling in the right ischio-rectal region, extending forward to the scrotum.

The scrotum and penis were very œdematous. A catheter introduced into the urethra could not be passed beyond the bulbo-membranous junction. From this space a few ounces of decomposing purulent urine were evacuated. The bladder was distended to the umbilicus. Temperature, 102° F.

Immediate perineal section was proceeded with, a metal catheter being passed into the urethra, down to the bulb, as a guide. The perineal tissues were found to be infiltrated with decomposed, purulent urine, and the end of the catheter projected into the perineum through the gangrenous and necrotic walls of the urethra. The superior wall of the urethra was intact, and by following along it, a probe was introduced into the bladder. Alongside of the probe a catheter was passed and the bladder evacuated. The catheter was left *in situ*. The swelling in the ischio-rectal space was incised and drained of several ounces of purulent decomposed urine.

Drainage of the bladder was maintained for twelve days. After removal of the catheter all the urine was voided through the perineum. The necrotic tissue was entirely separated by the twelfth day, and the wound was nicely granulating. Examination then revealed a defect of three-fourths of an inch in the floor and lateral walls of the perineal urethra. A false passage just anterior to this defect was divided. Eighteen days later, all of the urine was still voided through the perineal opening. There was no tendency to spontaneous closure of the urethral defect.

September 28. Perineal wound freshened. The urethra, which was deficient for three-fourths of an inch in its inferior and lateral walls, was dissected out, and a soft rubber catheter, No. 20 French, passed through the entire length of the canal into the bladder. The tissues adjacent to the deficient urethra were united over the catheter by two rows of buried chromicized catgut sutures passed Lembert fashion. The skin was closed with silk.

The catheter was well tolerated and remained *in situ* for one week. At its removal at the end of seven days the patient urinated voluntarily through the meatus, with absolutely no perineal leakage. Primary union of the perineal soft tissues. The catheter

was replaced for two days more. It was then permanently removed. All urine was passed per meatus. Perineum sound. No pain or difficulty in urination. Sounds passed daily, 20 to 25 French. Discharged cured, October 14.

At the end of nine months, No. 25 French sound passed easily. The patient still has a marked cystitis. No difficulty in urination. No leakage of urine. Had not been sounded for six months.

Remarks.—This patient had suffered a rupture of the urethra during straining at urination. The urine escaping through this rupture infiltrated the right side of the perineum, and the suppuration had then extended backward into the ischiorectal space. The walls of the perineal urethra had undergone gangrene from this suppurating process.

CARCINOMATOUS CHANGES IN AN AREA OF CHRONIC ULCERATION, OR MARJOLIN'S ULCER.¹

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DURING the past year I have seen two cases of this rare condition. The first case was a woman sixty-eight years of age, who was a patient in the Surgical Ward of the Philadelphia Hospital. For many years she had suffered from what was regarded as a varicose ulcer of the leg. During the last six months the discharge had become very foul; the edges of the ulcer had become thick, everted, hard, and rose-colored; and a section of the margin of the ulcer shows that it was epitheliomatous. The patient declined amputation.

The second patient was a woman fifty years of age, and was seen in the Jefferson College Hospital. Her father died at the age of 105; her mother, at eighty-seven years. While pregnant with the last child, fifteen years ago, she developed varicose veins of both legs; from the left leg, in the region which now is the seat of the ulcer, there was a considerable hæmorrhage, and a sore. The latter healed after her delivery, and remained well until two years ago, when it again broke out. It healed up in a few weeks, remained well for a month or so, and then broke out again; since that time it has remained open. On two occasions she went to hospitals and had it burned with caustic. Eighteen months ago it was the size of a ten-cent piece; now it is seven inches in width and six inches in length. She has considerable pain in the bone of the leg, which is much worse at night. The ulcer at some spots has undermined edges, and is elevated at certain places on the margin; its border is hard and dense, and sections which have been removed for examination show it to be an epithelioma. The patient declined to submit to amputation.

¹ Read before the Philadelphia Academy of Surgery, November 3, 1902.

The two cases cited above are instances of chronic ulcers of the cutaneous surface which became carcinomatous. The characterization of this condition as Marjolin's ulcer I think to be proper, because it was first carefully studied and accurately described by Professor Marjolin, of Paris, over fifty years ago.

It is a very ancient and well-demonstrated belief that cancer may arise, and, in fact, is rather apt to arise, in an area of chronic inflammation; for instance, on the lip of a pipe-smoker, on the tongue of a lather or carpet-layer—who holds nails or tacks in his mouth—on the scrotum of chimney-sweeps and paraffin-workers, in a gall-bladder containing gall-stones, on the skin of the nose where the bridge of an eye-glass or of a pair of spectacles has rested, on the tongue where the sharp edge of a tooth has been in contact, and in numberless other locations. It has been demonstrated that a laceration of the cervix uteri or an ulcer of the tongue is likely to become cancerous, and that an ulcer of the stomach occasionally becomes so.

The question of the relationship between gastric ulcer and gastric cancer is very much disputed. Strümpell and others are positive that there is a causal relation between them; and Schmidt has pointed out that a cell-degeneration, identical or of similar character, is to be found about each of these lesions.

On the cutaneous surface of the body, it is a rare occurrence for an innocent lesion to become cancerous, although occasionally this does take place. There is, of course, a certain relation between innocent and malignant epithelial growths, in the fact that in both there is an excessive growth of epithelium. We find this excessive epithelial proliferation in warts, in *Molluscum contagiosum*, and in some syphilitic and tubercular lesions; but, although in innocent conditions there is epithelial overgrowth, there is never unlimited and unrestrained growth, and the multiplying cells grow outward, as a rule; and even if they grow inward, they do not infiltrate tissues, and do not abolish the normally clear division which exists between derm and epiderm.

We have seen an area of chronic eczema on the left hand

of a locomotive engineer become cancerous. It is this hand that habitually rests upon the throttle-valve; and the throttle-valve is often warm, or even hot. We have seen cancer arise from a wart, from the scar of a burn, from the margins of an anal fistula. Nevi and moles occasionally become cancerous; but, as a rule, the malignant growth which springs from either one of these is sarcoma rather than carcinoma. We have never seen a carcinoma arise from a corn, although it has been alleged that it sometimes does so. That it occasionally arises from an old area of lupus, a syphilitic ulcer, or an ordinary chronic ulcer of the leg is undoubted.

When a cancer arises from an ulcer, it is not to be supposed that the connective tissue of the ulcer has been converted into epithelium. The proliferating epithelium of a cancer must spring from pre-existing epithelium; hence, it sometimes comes from epithelial elements, such as sweat-glands or hair-follicles, that lie undestroyed among the granulations of the ulcer, or, what is more common, from the edges of the ulcer itself. In the vast majority of instances, a malignant growth that arises in an area of ulceration on the cutaneous surface begins at some point on the margin of the ulcer.

The fact that malignant growth can follow chronic irritation is not proof positive that the irritation is its direct cause. A great many hold that in such a case the ulcer is not directly converted into a cancer, but that the chronic irritation in the ulcerated area simply allows of the admission and favors the destructive action of some cancer germ.

It is certainly not proved, at the present time, that cancer is due to a germ, although many of the ablest students and observers are of the opinion that it is. There is no theory as to the cause that is really capable of explaining all the phenomena of cancer. Beside the fact that regions that are irritated or injured are particularly prone to develop cancer, the parasitic theory has gained support from the observation that metastases take place; and that it may be possible to inoculate the growth into the lower animals, or that an accidental inoculation may take place at another part of the body of the indi-

vidual who is suffering from the disease. But there is considerable doubt as to the real cancerous nature of many of the tumors that have been transplanted from one animal to another; and, further, a great many different parasites have been alleged to cause cancer. Many supposed parasites are, however, really cell-degenerations; and, whereas yeasts and blastomycetes may exist in a carcinoma, it is very doubtful whether they are causative.

Gaylord and others strongly maintain that protozoa are the cause, but their experiments seem to have failed to demonstrate absolutely that epithelial cells were not transferred. There is no doubt that epithelial cells can be transplanted. We carry this process out deliberately in skin-grafting; and yet we do not assume that a parasite exists because the transplanted cells grow. It is equally possible to transplant the embryonal cells of cancer; and if they take root and grow, this is no proof that parasites are present.

The existence of metastases seems, at first glance, to be strongly suggestive of a parasitic influence. These secondary tumors are, however, not due to the proliferation of lymphatic structure in that region, as would be the case in an ordinary infection; but they are the result of the transfer of epithelial cells from the primary focus, the deposition of these cells in the lymphatic tissue, and their multiplication in this tissue. As Nicholas Senn says, a parasitic origin is improbable from histology and histogenesis; and the secondary tumors are not due to the growth of pre-existing lymphatic structures.

In view of the possibility that an ulcer of the cutaneous surface may become malignant, it becomes highly important that every chronic ulcer should be subjected to a thorough study for the purpose of making a careful diagnosis. As previously stated, in any chronic ulcer malignant change is most apt to appear at the edges, and persistent and increasing induration should excite suspicion. Of course, in the ordinary indolent ulcer there is a great mass of scar tissue, which often fastens the ulcer to the bone; but this mass of tissue does not have a local beginning, as it seems to appear and advance equally at

all parts of the edges, and also at the base of the ulcer. Then, again, the edges, though thick, are often smooth and are usually free from tenderness. The most chronic form of indolent ulcer is known as the callous ulcer; and this ulcer, unlike a malignant growth, is distinctly sunk below the cutaneous level. Its entire border is hard and knobby. It is not tender, and the appearance of the ulcer varies scarcely at all from week to week or from month to month.

When a carcinomatous change takes place in a chronic ulcer, induration usually begins at a portion of the margin and spreads slowly, progressively, and inexorably; although, even after it has existed for a considerable time, we may find but one-third or one-half of the margin of the ulcer to be malignant, the balance of its edge being non-malignant. In fact, it is extremely rarely that the entire margin of a large ulcer is converted into malignant disease; it requires a long time to effect this.

An important fact to remember is that, whereas very chronic, simple ulcers are rarely tender or painful, in malignant disease there is both induration and pain. This pain, as Paget long ago pointed out, is of a hot, scalding, or darting character.

The discharge of a chronic ulcer which becomes cancerous is increased in amount and becomes ichorous, and marked bleeding may occur. A foul, and even stinking, discharge, containing visible masses of destroyed tissue, is a usual feature.

Again, as Paget has likewise shown us, we find, here and there, on the margins of such a malignant growth, spots where apparent healing has occurred; but this is not due to the healing of actual cancerous tissue, but to the fact that non-cancerous regions have healed or that portions of the malignant growth have sloughed out, leaving a non-cancerous bed which will heal.

When the growth has attained a considerable size, we shall find that its base and margins are densely indurated; that the patient suffers from shooting or burning pain in the ulcerated area; that the floor is uneven, and frequently of a warty appearance or like a cauliflower; and that there is a profuse, stinking, and bloody discharge.

At some time or other the anatomically related lymph glands are bound to enlarge; although this seems, as a rule, to be late, probably because the previous induration has blocked up the lymph channels.

The most difficult case in which to make a diagnosis is one in which there has been great pre-existing induration of a chronic ulcer, and the knobby induration of the cancerous change is not appreciated and differentiated for a considerable time. In every doubtful case of chronic ulcer, portions should be removed from the margins and be studied by a skilled pathologist.

And right here a caution should be put forth. In two cases a pathologist reported carcinoma of the tongue, but recovery followed the administration of antisyphilitic treatment. In one case of ulcer of the leg a pathologist declared the condition to be cancerous, but Dr. Hearn and I were doubtful, and specific treatment effected a cure. Such mistakes sometimes arise because of the common belief that embryonal or atypical epithelial cells justify always a diagnosis of cancer, and yet healing sometimes occurs even when such a finding has been made.

What really does justify a declaration that carcinoma is present is the unrestrained multiplication of epithelium as shown by the infiltration of the apparently sound tissue at the margin of the growth. The finding of the pathologist is of the greatest value if proper material is sent to him to study. When the surgeon removes a bit of a growth for microscopic investigation, it should be large enough to make many sections, and should include not only a portion of the obvious growth, but also a portion of the adjacent and apparently healthy tissue.

If a carefully made clinical diagnosis is not in accord with the microscopist's diagnosis of carcinoma, no such radical operation as amputation should be performed until the situation has become clear and the diagnosis positive.

When a positive diagnosis of cancer arising in an ulcer of an extremity is made, there is only one proper operative

treatment; *i. e.*, amputation well above it, and the removal of anatomically related glands, even if another incision has to be made to accomplish this. For instance, if dealing with an ulcer in the middle of the leg, we should amputate well above the knee, and should then make an incision into the groin that will permit us to remove the inguinal and femoral glands. That a condition such as this is very rare is shown by the fact that the elder Gross, in more than a half-century of surgical experience, saw only three cases of ulcer of the leg that required amputation.

Marjolin's ulcer may be greatly benefited by the X-ray; hence, before considering amputation try this agent, if glands are not obviously enlarged. The late period at which glandular enlargement is apt to occur makes this plan hopeful.

In an advanced case in which operation is refused, the X-ray may still be of service in lessening the rapidity of the growth, checking discharge and hæmorrhage, and subduing pain.

A CASE OF DISLOCATION OF THE HIP IN ACUTE RHEUMATISM.

BY J. N. HALL, M.D.,

OF DENVER, COLORADO,

Attending Physician to Arapahoe County Hospital.

A BOY, ten years of age, was seen by me, November 24, 1899, on account of an attack of acute articular rheumatism which then affected chiefly the left ankle. By the 26th it had involved the knee and hip of the same side. A careful measurement of the trochanter in its relation to the pelvis and of the length of the limb was made on this day, because of the unilateral involvement, but all measurements were normal. Sodium salicylate was given in vigorous dosage.

On the 29th, the case was seen at my request by Dr. C. G. Hickey, who repeated the measurements, as we both thought that the severe pain in the hip possibly came from some trouble of a more serious nature than the articular rheumatism. The joint was exactly like the opposite one save for redness, tenderness, pain, and slight swelling.

After a month of sickness, during which shoulders, elbows, wrists, and finger-joints were involved, the patient improved as to his rheumatism, but developed two small bedsores over the sacrum. Because of these, he began to assume a right lateral decubitus. His rheumatism was so much better that I did not see him during January, 1900, until the 14th, when I was sent for, because his hip appeared to the parents to be out of place. The left hip was so evidently dislocated that I sent the boy to the service of Dr. Rogers in the Arapahoe County Hospital. He was in fair condition otherwise, and practically free from rheumatic pains and from fever.

Dr. Rogers, on examination, pronounced the condition to be a well-marked case of dorsal dislocation.

On January 17 he anæsthetized him, and reduced the hip by manipulation. No great difficulties presented, but the head of the femur, on finding its place, did not sink into the acetabulum as it would in a recent dislocation, but seemed to lie superficially,

as if the socket were filled up with exudates. The boy was placed in bed with a Buck's extension apparatus, and the leg kept in position for about three weeks before allowing him to move it, lest a redislocation should occur. He was discharged from the hospital with the bone apparently firm in its normal position, but with very restricted motion at the joint.

On April 9, 1902, Dr. Rogers carefully examined the case and found the following condition: Slight, almost unnoticeable, limp in ordinary walking; considerable thickening apparent about the head of the bone; rotation limited; could only evert the leg to an angle of about forty degrees from perpendicular; left thigh flexes only to right angle with trunk; adduction of left leg limited to an angle of thirty degrees (right, sixty degrees); on turning on the face, posterior motion only about half that of the right hip, and difference in the appearance much more marked, there being much protrusion over the left trochanter and an absence of the gluteal fold.

Within these limits movement was free and easy. On measurement, the left leg was found one-third of an inch shorter than the right; circumference of left centre thigh, fourteen and one-half inches; right, sixteen inches; knee, left, twelve and seven-eighths inches; right, thirteen and one-fourth inches; calf, eleven and three-fourths of an inch; right, twelve inches; measurement from medial line to line of protuberance of left trochanter, one-half of an inch more than same on right.

The boy seemed to suffer very little inconvenience from this restriction of motion, and the slight limp seemed due more to muscular weakness than to the defect in the joint.

INSTRUMENT TO PROTECT THE BRAIN WHILE DOING CRANIOTOMY WITH GIGLI SAW.

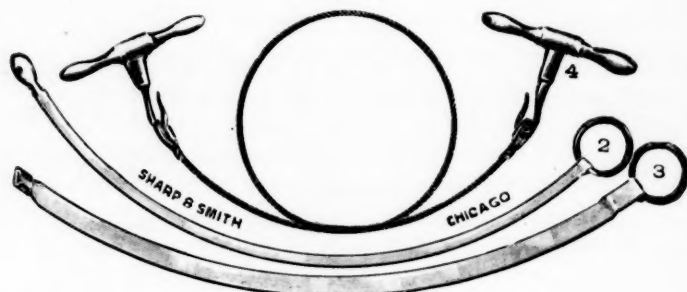
BY FREDERICK C. SCHAEFER, M.D.,

OF CHICAGO,

Professor of Surgery in the Post-Graduate School and Hospital; Gynaecologist to St. Elizabeth's Hospital; Chief Surgeon to St. Hedwig's Hospital.

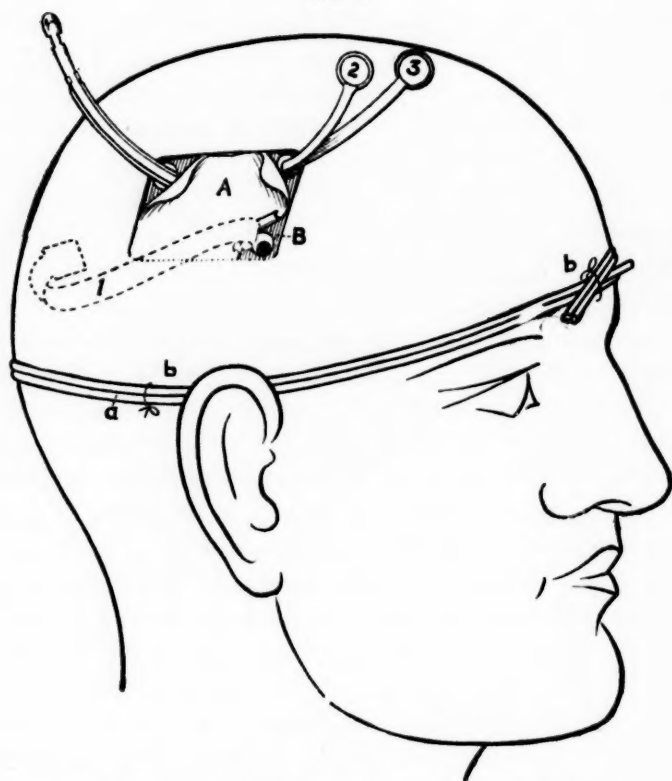
EVERY surgeon who has used the Gigli saw in opening the skull is cognizant of the fact that there is great danger of sawing through the dura mater, arachnoid, and pia mater into the brain tissue. The longer the cut the greater the danger on account of the convexity of the brain surface. The saw forms the string of a bow, the latter being represented by the arched skull bone. It is practically impossible to make an incision much over three centimetres long without damaging the brain or its coverings. Having known this accident to occur in the hands of experienced operators, I concluded to make an effort to overcome this difficulty, and devised a "brain protector" or "brain shield," which is herewith illustrated. Fig. 1 shows the mechanism. Fig. 2 represents my method for controlling hæmorrhage from the scalp. A rubber tube or cord is wound twice around the head and pulled taut; stitches (*b, b*) of silk thread are carried through the scalp and tied around the constrictor at three or four points, to prevent the latter from slipping. I have used this method for ten years with satisfaction. This figure shows the first step in using the brain protector. The watch-spring (2) and brain protector (3), connected, are passed between the skull and dura mater from the first through the second trephine openings. Fig. 3 shows second step. The brain protector (3) and watch-spring (2) are separated, and the Gigli saw (4) is attached to the nub of the spring. Fig. 4, technique for pulling watch-spring (2) with Gigli saw (4) attached through the openings of the skull, leaving the brain protector (3) in position. The saw having emerged from the cavity is detached from the watch-spring

FIG. 1.



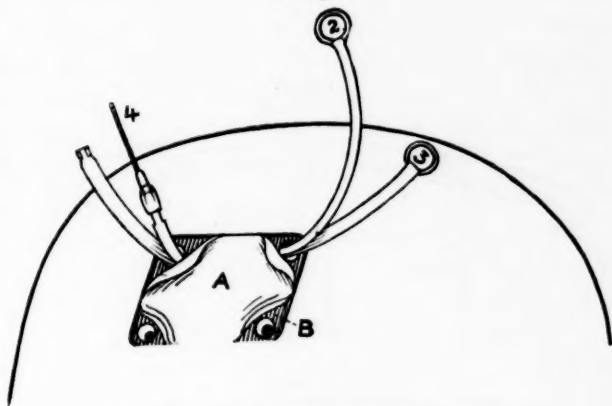
2, Watch-spring; 3, brain protector; 4, Gigli saw.

FIG. 2.



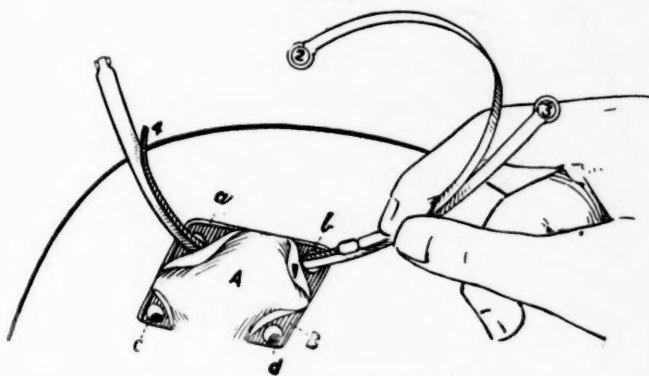
1, Retractor; 2, watch-spring; 3, brain protector. A, scalp; B, bone.

FIG. 3.



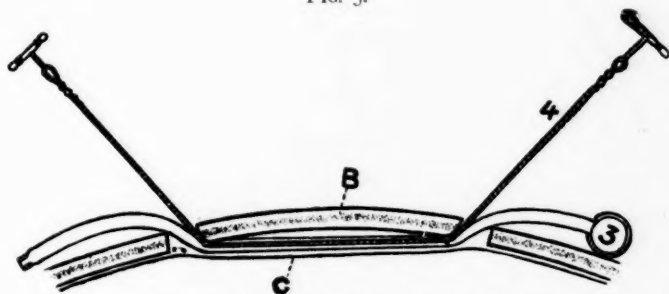
2, Watch-spring; 3, brain protector; 4, Gigli saw.

FIG. 4.



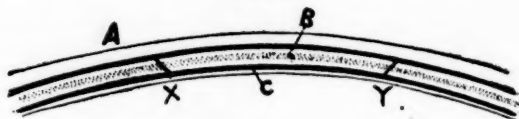
2, Watch-spring; 3, brain protector; 4, Gigli saw.

FIG. 5.



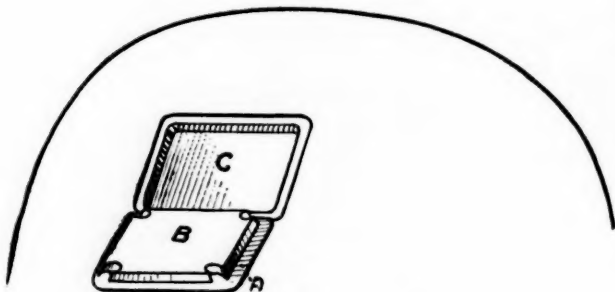
B, Bone; C, dura. 3, brain protector; 4, Gigli saw.

FIG. 6.



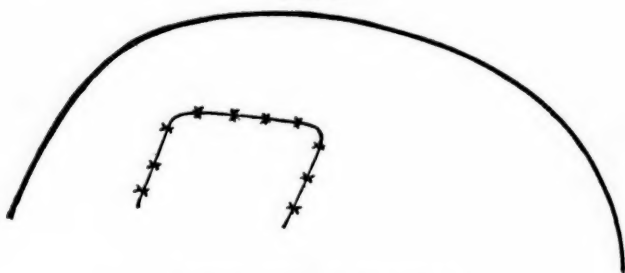
X, Y, Oblique cut; A, scalp; B, bone; C, dura.

FIG. 7.



A, Scalp; B, bone; C, dura.

FIG. 8.



Operation completed; lid replaced.

(2), and is now in position between the skull and brain protector (Fig. 5), ready to cut through the bone. In sawing, bring the saw obliquely through the bone so as to make a ledge (Fig. 6, X, Y) for the bone lid to rest upon. After having cut through one side of the intended lid, the same procedure is carried out (Fig. 4) from *a* to *c* and *b* to *d*. From *c* to *d* the saw is carried through the inner table only, indicated by dotted lines in Fig. 2. Fig. 7 shows the lid of the skull turned down. Fig. 8, lid replaced. Fig. 6, vertical section showing lid resting upon ledge, X, Y. The advantages of this instrument are apparent at a glance. There is absolutely no danger of sawing into the dura mater, an accident which frequently occurs when the Gigli saw is used without the protector. By sawing obliquely, a beautifully even trap-door is formed, leaving a substantial ledge for it to rest upon when closed. The instrument, with a special trephine, is made by Sharp & Smith. Any trephine with one-quarter inch lumen answers the purpose.

PRIMARY TUBERCULOSIS OF THE BREAST.¹

A REPORT OF A RECENT CASE, WITH A REVIEW OF THE LITERATURE OF THE SUBJECT.

BY W. SCOTT SCHLEY, M.D.,

OF NEW YORK,

Assistant Surgeon to Trinity Hospital and St. Luke's Hospital, Out-Patient Department.

THE following case of tuberculosis of the breast entered the Surgical Division at St. Luke's Hospital in the service of Dr. Robert Abbe, to whom I am indebted for the privilege of the operation in the case and permission to report the same.

The patient was a woman, thirty-two years of age, of English nativity, whose mother died of old age, and whose father died at seventy-six. A sister had died of carcinoma of the uterus. The patient had always been well and strong, had had five children, and nursed them without trouble with the breasts.

Present trouble was first noticed eight weeks before admission to hospital, when there occurred a slight dull pain in the right breast. Three weeks later a small lump, the size of a marble, was discovered in the upper and outer quadrant. This remained stationary in size for three weeks. Two weeks before admission the tumor began to grow rapidly in all directions, and the pain became more severe. There is no history of traumatism. Her appetite is good and she is otherwise well.

Physical examination shows an unusually well-nourished woman with good color of skin and mucous membranes. She has no cough and the chest examination is negative. In the right breast, occupying the outer hemisphere and chiefly the upper and outer quadrant, there is a mass the size of a mandarin orange, hard, coarsely nodular in feel, as though consisting of numerous enlarged, hardened, and matted glandular elements, resembling a bunch of grapes with the individual fruit packed closely together. It is not tender. It seems to occupy the site of the glandular

¹ Read before the Society of the Alumni of St. Luke's Hospital, February 13, 1903.

apparatus, and to be quite movable upon the deeper structures. The skin is not adherent, but connective-tissue prolongations from it run into the mass, serving to anchor it to some extent. The breast appears of the same size as its fellow, but is slightly fuller in outline in the outer hemisphere, and there is a slight darkening of the skin over the upper half of the growth. The mass as a whole can be lifted up by the finger inserted under its edge, and when pressed against the skin the individual nodules are very apparent to the eye and blanch the overlying skin. The other breast, both axillæ, and the supraclavicular glands are negative, as are the superficial glands of the body generally. The breast was amputated and the axilla cleaned out. The report of the Pathological Division is as follows:

"Macroscopic examination of the rather large breast shows that it is filled with a soft mass, some six centimetres thick, with irregular edges and numerous connective-tissue strands radiating from it throughout the remainder of the breast tissue. The central portion of this mass is quite firm in structure, and on section shows only dense fibrous tissue with a few ducts, from which a purulent fluid can be pressed. The growth resembles very closely a scirrhus carcinoma. The axillary lymph nodes are slightly swollen, but do not seem to be involved by the process.

"Microscopically, there is a moderate amount of simple adenoma of the breast. There is also abundant infiltration of the connective tissue with small round cells, and in places distinct tubercles with giant cells and central necrosis. The whole of the tumor is diffusely infiltrated with these evidences of tuberculosis, but there are no large cheesy masses and no other evidences of tuberculosis than those given above. The tubercle bacilli were demonstrated in stained sections of the tumor. The axillary lymph nodes are perfectly normal.

F. C. Wood."

Two weeks after the operation the patient was given an injection of seven milligrammes of tuberculin, but showed no reaction. As a control to this test, three other known cases of surgical tuberculosis were given each six milligrammes from the same dilution and gave typical reactions.

That the case is a primary one, as far as we can at present determine during life and without a most complete and searching autopsy, I think is shown by the findings at operation, the result of the controlled tuberculin test, and (especially) by the present condition of the patient and her constant good health since her discharge from the hospital, now nearly four years ago, and living as she has under the same conditions as before her operation.

That tuberculosis of the breast is an uncommon disease, certainly as compared with the malignant and benign tumors of the same region, a search of the literature upon the subject readily shows. Of all the neoplasms of breast reported scarcely more than 100 have been reported as tubercular. A number of these are doubtful and possible examples of simple mastitis in tubercular subjects. If we reject the cases not verified by histological examination or the finding of tubercle bacilli, the number is materially reduced to about sixty-five. In an examination of these again, the number of cases in which the disease may fairly be regarded as a primary one in the mammary gland itself is further very greatly reduced to about twelve, excluding, as we must, all determinable foci of tubercular disease elsewhere, — involvement of axillary and of supraclavicular glands, visceral infection, bone lesions, etc. These occurred in the large majority of the reported cases in addition to the disease in the breast, and must throw doubt upon that organ as the seat of primary infection in those cases. There were many recorded in which the axillary glands alone and of the same side were affected; and it is in this class of case that the most difficulty is experienced in determining the starting-point of the disease. A small focus of disease in the breast, where involvement is usually slower and so small as to be overlooked, may cause enlarged and suppurating secondary glands in the axilla which may be taken for the primary or the sole lesion. On the other hand, we believe that the breast may become infected by way of the axillary lymphatics, a point that is made much of by Halstead and Le Count, Powers, Verneuil, in the collected cases of Berchold, and by Salomoni. Furthermore, the lymphatics from the pleura are believed to play a part as carriers of the infection. It is practically impossible at present to determine with certainty in such cases the original focus of disease. In considerable disease of the breast with slight or absent axillary involvement, it would seem that we may be reasonably certain of that organ as the primary source of infection. In this connection, two cases, seen in private and hospital work within a year, are of interest. There was in each exten-

sive and characteristic tubercular disease of the axillary glands of one side and of the glands along the edge of the pectoral muscle, extending as a mass up to the very margin of the breast tissue, but with no involvement of it as far as could be determined before and during the operation. None had appeared several months later. One of these patients was fifty-three years of age.

To the valuable papers of Halstead and Le Count and Sabrazes and Binaud I am indebted for much from the historical side of this subject.

The history of mammary tuberculosis dates from the publication of Sir Astley Cooper's¹ famous work upon the diseases of the breast, in 1829. Since that time English authors seem to have almost ignored the condition. During the following years and up to as late as 1880, a number of cases were reported but not studied histologically, with the exception of Lancereaux's² case in 1860, the diagnosis being based on macroscopic findings only. Nélaton³ in 1839, Berard⁴ in 1842, Johannet⁵ in 1853, reported cases. Velpeau⁶ in 1854 distinguished three forms of the disease,—disseminated tuberculosis, lymphatic tumors, and lymphatic degeneration. Heyfelder⁷ in 1851 reported the first male case (man of twenty-six years). Horteloup⁸ in 1872, Poirier⁹ in 1883, Demme¹⁰ in 1889, Hebb¹¹ and Schede¹² in 1893, Ferguson,¹³ 1898, and Delbet, quoted by Duplay and Reclus,¹⁴ in 1892 reported cases in males. In 1860 Lancereaux reported a case before the Anatomical Society of Paris, the diagnosis being confirmed by microscopic examination. This appears to be the first recorded in which the diagnosis was so confirmed.

The second epoch in the study of mammary gland tuberculosis began with the presentation of Dubar's¹⁵ Thesis at Paris in 1881, when the diagnosis was based not only upon histological examination but upon the finding of the tubercle bacillus. Dubar reported two new cases and described two forms of the disease,—the isolated or disseminated nodular variety and the confluent. In the first form he regarded the disease as primary in the mammary gland in the majority of

cases, and in the latter as frequently secondary to disease in some other part, usually the axillary glands, but it might result from the coalescence of the nodules of the first form. Ohnacker¹⁶ in 1883 reported two cases, the first in which inoculations into animals (rabbits) were made. Many additional cases, some completely worked out, were reported up to 1891, the year of Roux's¹⁷ inaugural dissertation at Geneva.

Roux gave a complete review of the cases, thirty-one in number, that had been reported up to that time, and added three new ones, in two of which the tubercle bacillus was demonstrated. He also described a third form of the disease, the intraglandular cold abscess. Robinson¹⁸ in 1892 considered the mode of origin of the disease, and concluded that it is not primarily an infection of the gland proper, but first of the connective tissue and later of the gland epithelium, the evidence being in favor of a lymphatic or hæmatogenous origin rather than a duct infection. Dubrueil¹⁹ previously in 1888 had reported a typical example of this pericanalicular fibrosis with pressure and atrophy of the glandular structures.

In 1893,²⁰ Remy and Noel published a case of the disease in a patient of fifty-three years, the most advanced age recorded. Powers²¹ in 1894 reported thirty-five collected cases showing the disease evenly distributed throughout the third, fourth, and fifth decades of life. He found twenty-two cases in married and five cases in single women. Twenty-one of the twenty-two married women had borne children, and nine had had inflammatory troubles of the breast, six of a suppurative character. He believes that the puerperal state and subsequent lactation are not without predisposing influence upon the cause of the disease. Gautier²² in his thesis in 1895 collected and analyzed seventy-seven cases. In but forty-three of these was the lesion demonstrated to be tubercular by histological or bacteriological examination. The bacillus was found in but twenty-two. Sabrazes and Binaud²³ in 1896, together with a review of the literature, presented the most complete work from the pathological and histological side that is to be found. Scudder²⁴ in 1898 collected eighty cases, twenty-three of

which he rejects as lacking in positive evidence. One-half had borne children and the breast had been functionally active. Ten had had inflammatory troubles in the gland at some time preceding the appearance of the tubercular disease. Lactation was active during the development of the tuberculosis but a few times. Among these latter cases I have been able to find one each of Davis,²⁵ Ohnacker,²⁶ Dubar,²⁷ and Pisani.²⁸ Halstead and Le Count²⁹ in 1898 reviewed the history of the subject with an excellent presentation of the symptomatology and clinical course of the disease. They report a case well worked out. Ferguson,³⁰ in the same year, reported the last male case. Freiberg,³¹ also in 1898, and Smith³² in 1902 reported cases that seem examples of secondary involvement of the breast by extension from the axilla through the lymphatics. In Smith's, a lump, first noticed under the arm, gradually increased in size and travelled towards the breast, which later became enlarged and discharged seropus spontaneously. Salomoni³³ and Schifoni³⁴ in 1901 review the literature and report cases.

Tuberculosis of the mammary gland, then, may occur in the male or female and at any age, but is usually found in the third, fourth, and fifth decades of life and in the female, only eight male cases having been reported (three proven). It is more frequently seen after gestation and lactation. The majority of the patients were under thirty-five years of age, a number were under twenty,—the oldest fifty-three, the youngest under one year (Demme).³⁵ Hence it is prone to occur in young adults during the period of functional activity of the gland. In the primary cases the age of the patient and the apparent good health, frequently remarked, are noteworthy. In a case of Souplet's³⁶ and in one of Habermaas's³⁷ this was especially remarked. The relative frequency of the disease cannot be estimated from present data. In general it may be said to be of infrequent occurrence. Heredity would seem to play no greater part here than in tuberculosis elsewhere, and previous lactation and inflammatory trouble to act as predisposing causes to any greater extent than do places of diminished resistance in other parts. Injuries to the breast prior to

the development of the disease have been mentioned in a few cases (Poirier,³⁸ Hebb,³⁹ Sabrazes, and Binaud⁴⁰).

The infection must occur (1) through the ducts of the glands (Verneuil,⁴¹ Verchere⁴²); (2) through a surface wound (Demme,⁴³ Orthmann,⁴⁴ and Kramer⁴⁵); (3) through the blood or lymphatic channels, the generally accepted method; or (4) through contiguity of structure, extension from caries of the ribs or sternum (Heyfelder's⁴⁶ case).

The disease process, as a rule, is slow except during lactation, affects but one side, rarely both, and the axillary glands are enlarged from tuberculosis or simple hyperplastic inflammation. More rarely they are normal. It may in the beginning present no recognizable symptoms, the gland usually preserving its normal size and contour. But it may even be small and insignificant in an advanced case, as in one of Piskacek's.⁴⁷ In comparatively few cases is the volume appreciably augmented. The skin is normal, non-adherent, and without fistulæ. Nipple retraction was noted in a moderate number of cases only. Pain is not a constant symptom, and was spoken of as severe in but few of the cases. It seems dependent upon the rapidity of growth of the tumor. Direct nerve involvement has been described by Dubar⁴⁸ and Salomoni,⁴⁹ and by the former as the cause of the pains met with. In the end nearly all become painful, the breast enlarges, the growth undergoes the degenerative changes characteristic of tubercular tissue, and abscesses develop and fistulæ form.

In the first, the nodular or discrete form, characterized by its chronic course and painless insidious development, the nodules may be single or multiple. The breast is nearly always unchanged in appearance. The nodules are firm, movable, and distinct, or their outline may be indefinite, merging with the normal gland tissue. They may resemble "lymphatic glands situated on the margin or scattered throughout the breast." *

*In a very early case, in the person of a hospital nurse, under Dr. Abbe's care, whom I had the opportunity to see, the axillary glands were markedly tubercular, while the breast presented but a very small, ill-defined

These nodules may remain of the same size for years and then advance, or they may steadily increase in size over a long period of time. In Scudder's⁵⁰ case five years, in Mandry's⁵¹ four years, and in a number between one and two years. If single, they are more frequently found in the upper and outer quadrant. If multiple, they may coalesce and form tumors of considerable size before degeneration and suppuration occur (as in the case herein recorded), and may become attached to the skin or pectoral fascia. Or they may remain distinct and undergo the usual changes, the breast being filled with multiple cavities of cold abscesses. Sometimes a single cavity results. The foci open externally, as a rule, after a time.

Sections through the breast, before degeneration, show distinct, firm, slightly yellowish or wax-colored nodules, from the size of a pinhead to that of a marble, and with a peripheral zone of grayish or bluish tinged, slightly translucent tissue. Between the foci healthy gland substance is seen. Microscopically, the nodules begin as an infiltration, with embryonal cells around the glandular acini and ducts which later become invaded. The centre of the mass is destroyed while the process goes on and spreads at the periphery.

In the second or confluent form, more frequently met with, there is a more acute onset and greater enlargement of the breast. Degenerative changes occur and fistulæ result early, usually in less than a year, and especially in those near the time of lactation or with the tumor situated near the nipple, when it may be a question rather of weeks. Such instances occur in the cases of Habermaas,⁵² Hebb,⁵³ Mandry,⁵⁴ Piskacek,⁵⁵ Davis,⁵⁶ and others.

A single tumor is usually found and situated in the outer hemisphere of the enlarged mammary gland. It presents itself as an irregular, nodular mass, varying in size from that of a walnut to that of an apple or larger, at first hard, but softening

area of induration nearly under the nipple and deep in its mass. The feeling was much that of the sense of caking found in a single lobule of the lactating gland, but with less distinctness.

later and subsequently fluctuating. The breast may be double the size of the sound one and fistulæ are frequently seen.

In this form of the tubercular process, masses extending from the breast towards and as far as the axilla were frequently described, or the breast tumor may be joined to an axillary mass of glands by a band of indurated tissue. This was referred to in the cases of Hebb,⁵⁷ Pisani,⁵⁸ Gaudier and Peraire,⁵⁹ Salomoni,⁶⁰ Berchold,⁶¹ and others. It is regarded as a "characteristic sign of mammary tuberculosis."

In the vast majority of cases the axillary glands were enlarged, and in about 75 per cent. were tubercular. In a number the supraclavicular glands were also enlarged. Spontaneous cure before suppuration must be exceedingly rare, and is not admitted by all to exist. Even after suppuration and discharge, through operation or by nature, few if any recorded cases showed a true healing. The process continues by extension, involving new areas before the older have healed, and death more or less slowly advances when the disease is left to itself, particularly through the involvement of the thoracic viscera.

The examination of the breast in this confluent form finds it firmer than normal, and this firmness is as a solid mass. Sections show an irregular cavity, or several cavities usually communicating, filled with turbid serum, detritus, or puriform liquid. The walls are dense, usually roughened with fringes and villousities. The lining is a soft, grayish or purplish membrane. Externally are found fibrous prolongations into the adjacent tissue. The tissue surrounding these cavities is of increased density and shows small grayish transparent areas, or yellowish opaque spots, representing the extension and infiltration of the tubercular process. Fistulæ may connect the cavities with the exterior.

Roux's third form—the intraglandular cold abscess—is a terminal product, usually of the confluent tuberculosis, and is of slow development. I could find no record of its occurrence in a patient under nineteen years of age (Roux's case⁶²). It occurred more frequently after pregnancy. Diminution in the

size of the breast results. The abscesses are lined by a soft, reddish membrane, and contain a thin pus often with thicker masses of grayish or yellowish material. Tubercles and tubercle bacilli are, as a rule, not found in the walls or contents of these abscesses.

Miliary tuberculosis affecting the breasts has been found at autopsy.

In several cases the earlier symptoms and course of the mammary involvement varied from the usual form. In Orthmann's⁶³ (frequently quoted) it began apparently subcutaneously and resembled an ordinary furuncle. The base became indurated and extended, forming a tumor of considerable size. In Poirier's⁶⁴ two small vesiculated pimples with indurated base first appeared. In Kramer's⁶⁵ an ulcer appeared near the nipple, and later nodules formed within the breast and were connected to the ulcer by a band of indurated tissue. In Demme's⁶⁶ case induration began about the origin of a preformed sinus, the result of a simple mastitis.

In three cases retraction of the nipple was the first symptom noted. In Dubrueil's⁶⁷ two years before the tumor was discovered; in Verneuil's⁶⁸ the retraction began shortly after confinement, five years later a mass was discovered; in Warden's⁶⁹ it was noticed by the patient while carrying her third child, and eleven months after its birth the mammary tumor was found.

In many cases the disease was regarded as primary in the glands and secondarily infecting the breast. A case of Reverdin's⁷⁰ is regarded as a proven example of this. Also eight of a series of thirty-seven collected by Berchold,⁷¹ and Smith's⁷² case, referred to above. Verneuil regards this as the usual method of infection, notwithstanding the known difference in the speed of progress of tubercular disease in the breast and lymphatic glands. Halstead and Le Count lay stress upon this retrogressive lymphatic involvement from the axillary glands and thoracic cavity, and believe that "a primary mammary gland tuberculosis has yet to be confirmed by autopsy." A hæmatogenous origin, however, is not to be

ignored, while infection by way of the ducts is scarcely probable. Powers regards the infection in the breast as probably transmitted from the axillary lymphatics.

Auto-infection, by way of the blood current, from a previously existing focus of disease is probably the usual way.

The scarcity of the tubercle bacilli in the exudates and tissues is generally remarked. Gautier found that they were demonstrated but twenty-two times in seventy-seven cases collected. Scudder but twenty-nine times in eighty cases. Habermas found two bacilli in twelve sections, Piskacek, a few only in 400 preparations. There are other observers who have failed to find them in over 100 sections. In a number of instances the more delicate inoculation test was positive, where they could not be found in sections.

In the cases of more recent years, when a greater number have been examined for the bacilli and inoculations oftener made, the percentage of positive results has been higher.

The diagnosis of tuberculosis of the breast, in its earlier stages, cannot be made from the clinical symptoms and macroscopic appearance. This is particularly true of the discrete form and when enlarged glands or evidences of a tubercular focus elsewhere are lacking. If the disease is well advanced, or tuberculosis exists or has existed in some other part, there is less difficulty. In the majority of cases the diagnosis was not made prior to the operation.

The tumor may be mistaken for: (1) Simple Cysts, (2) Fibro-adenomata, (3) Carcinoma, (4) Sarcoma, (5) Gummata, (6) Actinomycosis. It may also be necessary to differentiate the process from a chronic interstitial mastitis.

Simple cysts are usually more circumscribed, fluctuate earlier, are painless, and there are no axillary glands. Aspiration demonstrates their character. With the fibro-adenomata there will be rather greater difficulty. They are apt to occur in young adults and are of slow growth. The fibromata are commoner, usually more distinctly movable in the gland, and the axilla is free. In Davis's case it is of interest to note that the tuberculosis had apparently been engrafted upon a pre-

existing adenomatous tumor. In the earlier stages of carcinomatous disease there may be confusion. This trouble begins, however, as a rule, at a more advanced age, is usually more rapid and with greater pain. The axillary glands do not suppurate and are not painful at so early a date. Pilliet and Pladet⁷³ and Warthin⁷⁴ have reported cases in which carcinoma and tuberculosis existed in the same breast. In sarcoma the growth is rapid and the skin is involved early. The cutaneous veins are apt to be enlarged. Gummata are to be distinguished by the history, coincident lesions, or response to specific treatment. The nodular form of gumma is rarer than the diffuse mastitis of syphilitic disease. In actinomycosis the axillary glands are usually not enlarged. The yellowish-green granulations characteristic of the fungus are formed. In chronic mastitis there is lack of glandular infiltration in the axilla. The feel is less that of a mass and more that of a spread out or diffuse process. In a case that came to me in the outpatient service at the hospital, it seemed necessary to excise a small bit of the tissue under cocaine to make a certain diagnosis.

The treatment of most accessible foci of tubercular disease at the present time is that of removal, with the institution of suitable climatic and hygienic conditions as soon thereafter as possible. Early removal of the breast and axillary glands is the rational method of treatment and offers the best hope for speedy and permanent cure. It is usually unnecessary to include the pectoral muscles. In primary cases and in those with the disease confined to the breast and axillary glands, the prognosis after breast amputation is good. Those of the so-called "tubercular disposition" will have a rather less favorable outlook for the future.

In secondary cases the prognosis depends upon the seat and degree of the primary lesion. Occasionally this will be of sufficient severity to contraindicate radical interference.

In the discrete or nodular form, a removal of the nodule together with a wedge-shaped section of the breast has been recommended, provided the case can be kept under observation

for some time. There are those who prefer to leave the axillary glands undisturbed if they are not appreciably enlarged. Partial operations, however, are not entirely free from risk, although often possible and attractive. Lane's first case is an example of the danger of incomplete operation. The tubercular process and invasion usually extend beyond the point at which the eye ceases to appreciate it.

In the less common cases of cold abscess without changes in the axillary glands or where radical operation is contraindicated, aspiration or incision of the abscess with the injection of iodoform emulsion or of iodine and potassium iodide (Durante's method) has been recommended.

The following methods of treatment have been employed in the cases reported:

- (1) Curetting of sinuses.
- (2) Cauterization of sinuses.
- (3) Injection of sinuses and cavities.
- (4) Incision or aspiration of abscesses.
- (5) Removal of the tumor alone.
- (6) Removal of the axillary glands alone.
- (7) Removal of the tumor and a portion of the breast.
- (8) Removal of the breast and tumor.
- (9) Removal of the breast and axillary glands, the last and safest.

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THE DIAGNOSIS OF INTESTINAL INJURY FOLLOWING ABDOMINAL CONTUSION.¹

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WHEN external signs of penetration of the abdominal cavity are present, as in gunshot or stab wounds, the indications for operative treatment are plain and direct, and scarcely ever is there any hesitancy in the course to be pursued. Not so, however, if a force of unknown velocity or energy has expended itself within the abdomen, leaving perhaps no trace of violence upon the skin or muscular surface. Then it becomes necessary to make a most careful examination of both the subjective and objective symptoms presented by the patient, to separate the trivial from the important points, and with our best judgment to sum up the evidence for or against operative procedure. A few years ago the diagnosis of grave internal injuries was considered sufficient, the patient at the same time being left to the tender mercies of a non-interfering policy. The mortality was correspondingly high, as illustrated by Petry's collection of 160 cases of rupture of the intestine, where 93 per cent. died and 7 per cent. recovered through the formation of abscess with fæcal fistulæ. Other collections of cases give even a higher mortality, up to 97 per cent. and 98 per cent. Unfortunately, there is no pathognomonic symptom present in injury to the intestinal tract, but there are a number of symptoms which, when assembled in the same case, may lead us to form a fairly accurate diagnosis. I purpose, therefore, to review these symptoms and discuss them under separate headings, for the sooner operation is undertaken after the diag-

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nosis is made the greater will be the number of recoveries. The operative mortality at present stands somewhere between 50 per cent. and 60 per cent.

I. *Mechanical Considerations of the Intestine, the Force, and the Abdominal Wall.*—The stomach and intestine may be injured in one of four ways, depending upon the character and energy of the force and the portion of the abdominal wall upon which this force expends itself. It may be crushed, burst, torn, or the blood supply so interfered with that death of the part follows.

First, and perhaps most frequently, the viscus is crushed between the force on the one hand and some resistant portion of the body on the other, as the pelvis or spinal column, or even an object outside of the body, as the ground or a wall. As a result, a more or less circular opening is made in the bowel in a position usually opposite to the mesenteric attachment. If the force is not sufficiently strong to at once make an opening in the bowel, it may so damage the coats of the viscus as to produce a slough, which some time later separates with perforation. Again the force may expend itself upon the weakest coat of the bowel, namely, the mucous, producing an ulcerated or necrotic condition, while the muscular and peritoneal coats remain uninjured, as exemplified in traumatic gastric ulcer or traumatic appendicitis. Such an ulcer may heal without further symptoms or may be the forerunner of perforation, or in healing may produce so much fibrous tissue as eventually to lead to obstruction of the bowels.

Secondly, if the stomach or bowel is filled with food or gas and the force is applied in such a manner as to distend the organ to its utmost, bursting may occur. Under such conditions the peritoneal coat will be more widely lacerated than the mucous. This form of injury is not, however, as common as was formerly thought to be the case, and I have not seen a single example in which I believed that bursting had taken place.

Thirdly, if the force expends itself at some fixed portion of the alimentary canal, as the lesser curvature of the stomach

and the duodenojejunal juncture, tearing of the gut may take place. This may also be the form of injury if the peritoneal cavity has previously been the seat of an inflammation with the production of adhesions.

Lastly, the bowel itself may slip away and escape from the direct force of the injury, leaving the mesentery to be torn or crushed. Then, the nutrition or blood supply to part of the bowel having been destroyed, gangrene of the gut will take place at some later time.

The character of the force will in a way determine the kind of injury that will take place. If it be circumscribed, of high velocity and small inertia, as a kick or a blow from some small, rapidly moving object, crushing of the intestine is more likely to take place; while if the force is diffuse, as in a slow-moving ponderous object of great inertia, the passage of a wheel or a blow from a car-bumper, the bowel is more apt to be torn at one of its fixed points or the mesentery injured.

The rapidity with which grave symptoms will develop depends upon three things:

First, *The amount of food present in the alimentary tract.* When the stomach or intestine contains food or liquid fæces, immediate extravasation takes place with correspondingly rapid development of symptoms. If, however, the injury occurs after a prolonged fast, there may be scarcely a symptom for many hours, as there is no intestinal contents to escape, and also the usual bacterial flora of the mucous membrane is diminished by fasting.

Second, *The portion of the alimentary tract ruptured.* A tear of the stomach or one at the beginning of the jejunum will give symptoms of peritoneal involvement less rapidly than a rupture at the end of the ileum, owing to the fact that the upper intestinal tract contains relatively fewer and less virulent organisms than the lower portion.

Third, When the damage has been less than an immediate perforation, as in mesenteric injury or injury to one of the coats of the bowel, grave symptoms may not appear for hours, days, or even months.

Abdominal Muscles and Fat. — The condition of the abdominal wall, whether it be muscular or not, or thickly covered with fat, may very greatly alter the concentration of the blow, as the thicker the walls the more diffuse does the force become in its passage through, the energy being deflected in radiating lines by the fat and bundles of muscular tissue. Also, the fact that the abdominal muscles are strongly contracted in anticipation of the blow may save the intestine from the violence of a very great force. We have all seen in sparring contests the tremendous blows which one opponent will give the other over the epigastrium; and yet I cannot now recall a single case where such violence produced an injury to the intestinal tract, for the abdominal muscles are strongly contracted in anticipation of such a blow. We have in these various mechanical considerations good reasons why blows of the same force and energy produce different lesions and results in different individuals. Let me relate a few cases illustrative of these mechanical considerations.

CASE I.—A cavalryman during an Indian campaign out West was kicked in the abdomen by a horse. Food was scarce, and the man had been fasting for some time. He picked himself up, rode for hours, and not until he had partaken of food did symptoms of intestinal rupture appear. The post-mortem examination revealed a ruptured gut. I do not know the reference to this case, but think I have quoted rightly the main points of the history.

CASE II.—A strong colored man, aged forty-two years, was struck a glancing blow in the abdomen by a rolling steel ingot weighing two tons. He was knocked down and the ingot rolled over on his left thigh, producing a simple comminuted fracture of the femur. This happened at 8.30 A.M., and the man had not partaken of food since the previous evening. He was much shocked by the accident, but reacted promptly. Fifteen hours later no symptoms had appeared indicative of severe intestinal injury; temperature, 99° F.; pulse, 88; respiration, 22; slight tympany; no vomiting; no rigidity; some pain in region of umbilicus, with natural respiration and no abdominal facies. During the next six hours symptoms of perforation rapidly appeared; pulse and respiration rapidly increased; temperature fell below

normal; vomiting began; tympany appeared with marked tenderness in the region of the umbilicus, and the expression of the face was anxious and drawn. Operation revealed the first part of the jejunum completely torn across, the laceration extending for two and one-half inches into the mesentery; and in another place there was a two and one-half inch tear in the mesentery which had extended into the small gut, and about a foot of the intestine showed beginning gangrene. Death speedily followed the operation. The late appearance of the symptoms in this case was undoubtedly due to the complete emptiness of the upper intestinal tract, and my reason for not operating at once was that I could not believe so enormous a mass of steel would strike the abdomen without inflicting a damage which would at once be patent to the eye.

CASE III.—E. A., white, aged thirty-seven years, a sawyer, was struck in the right inguinal region, at 4.30 P.M., by part of a board which slipped from a circular saw. Shock was profound but reaction good. The abdomen was flat, with some tenderness and pain; no rigidity; breathing regular; no distention. The physician in attendance gave calomel and applied an ice-cap to the abdomen. I saw the patient next day shortly after noon, twenty hours after the injury. There was then present severe pain; rigidity and marked local tenderness; increasing distention; liver-dulness absent; abdominal facies present, but no vomiting. Incision was made in the right semilunar line below the umbilicus, and a perforation found in the lower ileum the size of a lead-pencil on the free border of the gut. The perforation was sharply defined and punched-out in character. Considerable turbid fluid was present in the peritoneal cavity. The opening was sutured, the abdomen flushed with hot salt solution and closed with drainage. Recovery was uneventful. It is interesting to note that the fluid removed from the abdomen at the time of operation gave a pure culture of colon bacillus. This probably represents a crush of the bowel, in which separation of the damaged area with extravasation did not take place for twelve or fifteen hours after the injury.

CASE IV.—G. L., white, aged thirty-five years. A large man of very powerful build, with a thick layer of abdominal fat; a constant and heavy consumer of alcohol; injured at 8.05 P.M., the rear wheel of a chemical fire-engine passing diagonally across the

abdomen from the crest of the right ileum to the left short ribs. No record of the patient's condition for fifteen hours is obtainable. When seen by me his temperature was 101° F.; respiration, 24; pulse, 120 and running; abdominal facies; respiration rapid, shallow, and thoracic; abdomen greatly distended, great pain, and exquisite tenderness, much discoloration of the skin in the track of the wheel.

Operation.—Median incision around umbilicus. Skin and underlying fat entirely stripped from abdominal muscles, with much bruising of the muscles and infiltration of blood. On opening the peritoneum a large amount of blood or bloody fluid gushed out. Three tears were found in the mesentery of the small bowel, two of which were bleeding freely, but the bowel itself was not opened. A beginning gangrene of the gut had appeared in two places from lack of blood supply, and it became necessary to make two resections, one removing fifty-three inches and the other eighteen inches of the small bowel. The abdomen was flushed with hot salt solution and closed without drainage. As much salt solution as possible was left within the abdominal cavity. Drainage was not employed for fear of infection through the bruised and lacerated abdominal wall. At the time of operation two quarts of salt solution were given intravenously. On recovering from the ether he vomited twice, the vomited material containing two small blood-clots. For thirty hours his condition was good. There was moderate distention, which was relieved by two enemata, both bringing away a large amount of flatus and some faecal material. During the evening of the second day he became delirious, and during the night the delirium became very violent and characteristic of mania a potu. On the third day very little distention was present; there were no abdominal symptoms and no signs of peritonitis; the heart, however, was growing weaker, and the delirium was very active and uncontrolled by drugs. Seventy-three hours after operation the heart suddenly failed and the patient was dead in a minute. No post-mortem allowed. This is an example of the intestines escaping from the direct violence of a slow-moving force of great inertia, the force expending itself upon the fixed portion of the mesentery.

CASE V.—Mr. A. E. Barker (*Lancet*, July 21, 1900, p. 164) reports a most interesting case of damage to the upper part of the jejunum which resulted in the formation of a stricture with

enormous dilatation of the gut above. A man aged twenty-one years was run over by a loaded wagon, two broad wheels of which passed across the lower thorax, breaking five ribs. The man recovered from his injuries, but seven years later was operated upon, when a firm fibrous stricture of the jejunum was found seven feet from the duodenum. The wheels had evidently injured the bowel just short of perforation, and during healing a large amount of fibrous tissue had formed, which slowly contracting produced the stricture.

CASE VI is another example of long-delayed perforation after the injury. I am indebted to my colleague, Dr. Harte, for being present at the operation. M. D., white, laborer, aged forty years. Twelve days previously to his admission to the Pennsylvania Hospital he was run over by an empty wagon, the wheel passing across the lower portion of the abdomen. For eight days his temperature remained normal and then became irregular. He complained of pain in the right side of the abdomen. On admission there was marked rigidity of all the abdominal muscles, particularly of the right side, with universal tenderness; slight distention; no vomiting. The abdominal distention gradually increased and the pain became more severe. The next day under ether an incision was made in the right semilunar line below the umbilicus. The muscles were found to be bruised and infiltrated with old blood-clot. On opening the peritoneum there was an escape of gas, followed by faecal material of very foul odor. A large quantity of this material was evacuated; much lymph on the coils of intestine; no perforation of the intestine could be found. The abdomen was irrigated with salt solution and the cavity packed with iodoform gauze; no closure of the wound was attempted. He reacted well after operation, and the next day the abdomen was less distended and the patient more comfortable. He was fed by rectum, nothing being given by mouth. On the second day the wound was dressed and a considerable amount of pus-like fluid evacuated, but with no marked faecal odor. The wound drained well without further faecal characteristics, and the patient made an uneventful recovery.

From a consideration of the various mechanical principles involved in abdominal contusion we gain but small material knowledge. We see that certain kinds of force tend to produce certain kinds of injury in special regions of the abdomen, but

symptoms of the resultant damage may be immediate or greatly delayed through the action of a flaccid or resistant abdominal wall, and the condition of the intestine, whether it be full or empty. However, it is important to gather from the history of the injury as much evidence as possible of the foregoing mechanical principles, for in a case that is doubtful these straws may point to the proper line of treatment.

II. *Symptoms which can be elicited in the Patient, both Subjective and Objective.*—(a) *Shock.* From shock alone we can tell very little. Occasionally very severe injuries will be followed by no appreciable shock, as illustrated in Case I, and again trivial injuries will be followed by most profound shock.

CASE VII.—J. A., white, laborer, aged thirty-eight years. While working at the top of a building, the roof caved in, and the patient fell a distance of thirty or forty feet. He was admitted to the hospital in a condition of profound shock. Complained of pain in the lower lumbar region, buttocks, thighs, and over the short ribs and abdomen, particularly on the right side. There was some rigidity of the abdominal muscles. He reacted fairly quickly, and the next day was more comfortable. The abdomen was then slightly distended, tender, and moderately rigid. Sweating was profuse, respirations short and mostly costal. No abdominal facies and no vomiting. Under calomel his bowels were freely moved and the abdominal distention went down. Within two or three days all signs of abdominal injury had disappeared.

CASE VIII.—M. C., aged two years, was struck by a wagon and rolled along the ground, but the wheels did not pass across the body. On admission to the hospital the patient was in a state of profound shock. Numerous contused areas were visible on the legs, head, and abdomen. Abdominal pain and tenderness very marked; also slight rigidity of the muscles. No vomiting. Reacted well, but was extremely restless for forty-eight hours, at the end of which time the abdominal symptoms had disappeared and recovery speedily followed.

The speed with which reaction from shock takes place tells us nothing, for when shock is unassociated with hæmorrhage, very severe injuries may react promptly to stimulation.

(b) Temperature at first is a guide only to the degree of shock; but when reaction has taken place and it has risen above

normal, a secondary fall to below the normal, with an increasing rapidity of pulse and respiration, is indicative of most serious trouble.

(c) A steadily rising pulse after reaction has taken place is also a bad sign, but it must be associated with other symptoms to prove alarming.

(d) Respiration in the presence of shock is usually quiet and shallow. To be indicative of an intra-abdominal lesion, it must be short, frequent, and thoracic in type. It may have all of these characteristics, however, from a simple severe contusion of the abdominal wall where the muscles are bruised and painful, and also in the presence of marked tympany where the abdominal muscles are prevented from acting by the distention.

CASE IX.—S. G., white, a driver, was kicked by a horse in the epigastric region. Shock moderate; complained of intense pain in the abdomen. There was a contused area over the epigastrium, with great tenderness and muscular rigidity. Respiration was painful, jerky, and thoracic. Abdominal facies and vomiting absent. He reacted well and promptly. In two days he was very much more comfortable, and in another two days had entirely recovered, although some tenderness still remained in the epigastric region.

CASE X.—L. S., white, brakeman, aged twenty-eight years, fell off a bicycle and was thrown under the wheels of an automobile cab, one wheel of which is said to have passed over his body about the epigastric region. On admission he was in profound collapse; pulse imperceptible; extremities cold. He complained of great pain over the abdomen, especially in the epigastrium. Respirations short and thoracic; marked epigastric tenderness and rigidity; no vomiting. Reacted well and quickly. Next day there was evidence of swelling in the epigastric region. The patient, however, continued to improve, and in a week's time was entirely free from pain and tenderness.

When, however, we have increasing shallow thoracic breathing without distention and without sign of abdominal bruise, and associated with muscular rigidity, it becomes an important symptom of considerable value.

(e) *Facial Expression.* The abdominal facies consists of a peculiar drawing of the lines and deepening of the furrows of the face, which give an anxious, careworn, and painful expression to the countenance, while the eyes are questioning and anxious, and search the faces of the people about. A lack of knowledge of drawing prevents me from painting this picture in words, but when it has been seen a few times it gives a very characteristic expression or stamp to many different types of face. It is not present in shock, but comes on after reaction has taken place, and is perhaps concomitant with development of peritoneal inflammation. When present, it is to me the most positive of all the symptoms of severe intra-abdominal injury. I have failed to see it, though, in several injuries, but I cannot recall ever having noted it as present in a case which failed to show a serious lesion. I suppose there must be exceptions to this, but I judge they are rare.

(f) *Pain, Tenderness, and Muscular Rigidity.* Pain and tenderness are always present in severe injury, but they are also present in simple contusion of the abdominal wall. Often, however, we can elicit from the patient the fact that the pain or tenderness seems superficial, or that it is deep and radiates to the back or loin or pelvis. Under such circumstances, when pain is deep and radiating, it becomes significant. Marked rigidity of one or both recti muscles is frequently present in simple abdominal contusion, but it is usually at its height from the start, and gradually diminishes as time passes. Again, if the palpating fingers are moved gently over the abdomen for some time while the attention of the patient is distracted from this region of the body, the rigidity will be felt to yield slowly, to become prominent again on sudden pressure. In other words, the patient, knowing that the part is sensitive, voluntarily keeps the muscles contracted for fear palpation will increase the pain. The rigidity which is characteristic of an intra-abdominal lesion is progressive in its firmness, and when well developed is of board-like hardness, neither increasing nor decreasing under palpation. However, such a distinction is not always characteristic, as the following cases will show.

CASE XI.—A. L., white, plumber, aged nineteen years. Two days before admission to the hospital he fell against a box, bruising the right flank and right side of the abdomen, since which time he has had increasing intra-abdominal pain, with increasing distention, vomiting, and no movement of the bowels. On catheterization the urine was found quite bloody. The right rectus was rigid, with great tenderness over the whole right side of the abdomen and flank. Moderate tympany was present; liver-dullness decreased. Operation was urged and declined. Under treatment the man gradually improved, with less abdominal pain and a decrease of tympany. The bowels were well moved. Hæmaturia persisted, but at the end of two weeks the blood in the urine was only microscopic. Recovery was uneventful.

CASE XII.—J. C., white, laborer, aged thirty-nine years. While unloading a wagon he was struck in the back by a sack of grain, causing him to fall forward against the pole of the wagon, the pole striking him in the pit of the stomach. There was immediate nausea, almost unconsciousness, with great abdominal pain. When seen a few hours later no shock was present. There was considerable tenderness over the abdomen, with rigidity of the muscles of the upper portion. No further vomiting, no abdominal facies. The next day the patient felt quite comfortable, except for abdominal tenderness. The recovery was uneventful.

CASE XIII.—M. P., white, aged eight years, was knocked down and run over by a wagon, the wheel or wheels having apparently passed over the abdomen above the iliac crests, with evidence of contusion of the abdominal wall. The patient was dazed and considerably shocked; abdomen rigid and tender; no vomiting; no abdominal facies. Reacted well and abdominal pain gradually disappeared. Recovery was uneventful.

(g) *Tympany*. Frequently a small amount of tympany or even moderate distention is present a few hours after abdominal contusion without any severe intestinal lesion. Under such circumstances it is probably a manifestation of a transient intestinal paresis, readily yielding to a high enema with the passage of flatus. Distention, however, which is progressive and extensive, or which appears late, a day or more after the injury, is worthy of very serious thought, especially when associated with other signs of obstruction. It then becomes a grave symptom.

(h) *Liver-Dulness.* Diminished or absent liver-dulness in the right nipple or anterior axillary line has been a most unsatisfactory symptom to me. It may at times indicate free gas in the peritoneal cavity, but intestinal distention will give the same sign, and I have seen liver-dulness completely absent without a particle of gas in the peritoneal cavity. In my experience I have been unable to place a just value upon this symptom.

(i) *Vomiting.* Vomiting that occurs immediately after the accident has no practical significance, for there are few people who can stand a sharp blow in the abdomen without being nauseated. When it appears after reaction has taken place, or even a day or more after injury, it becomes a symptom of great importance. It is then usually associated with distention and obstruction.

(j) *Singultus.* Obstinate and continuous hiccough I have seen but once, where it was a late symptom in a contusion of the epigastric region. I should judge that it occurred only in injury of the bowel adjacent to the diaphragm, and was due to the irritation of the peritoneal covering of the diaphragm. When present, it must be a symptom of the greatest import.

(k) *Leucocytosis.* So many factors at the time of injury besides a ruptured intestine may induce an increased leucocyte count that I feel little reliance can be placed upon this symptom when present in the first twenty-four hours. In such cases, where perforation takes place late, it might be an aid to diagnosis, but owing to the frequency with which we see contusions and injuries to other portions of the body associated in the same case with abdominal contusion, it would be impossible to say to which injury we should attribute the increased leucocyte count.

The histories of the cases presented in this paper have been chosen for the most part from thirty or thirty-five patients that have come under my own observation. They were picked out because they illustrated one or more of the points under discussion, and I have tried as far as possible to be brief and to omit all useless repetitions.

Conclusions.—What conclusions may we fairly draw from these remarks and the histories just detailed?

First. That a moderately assured diagnosis of grave injury must be made before operation is undertaken, or we will open many abdomens to find the trauma confined to the abdominal wall. In a series of 100 consecutive cases of abdominal contusion as they enter a general hospital, perhaps thirty or forty will have received a grave injury demanding operation, while the other sixty or seventy recover without any operative procedure. For the sake of argument, I am willing to grant that if the abdomen is immediately opened in each one of the 100 cases there will result a smaller percentage of deaths than if the surgeon waits for some other symptoms of intestinal damage. But can we call such radical and empirical treatment the science of surgery? Would any of us receiving a blow on the stomach sufficient to shock and nauseate say, "Have Dr. ——— see me, for I want my abdomen opened at once?" Answering for myself, I say, No; for I should wish the surgeon in attendance to be moderately assured of his diagnosis before I took that smallest of risks, viz., an abdominal section in the hands of the most skilful surgeon. If I were one who always, without exception, advocated immediate operation in appendicitis as soon as the diagnosis is made, I could with greater force urge immediate operation in all cases of abdominal contusion, for the seriousness of the two conditions is scarcely comparable to my mind.

The teaching of many of the modern writers when they urge operation in all cases presenting pain, rigidity, and local tenderness seems to me too radical, for we have various kinds of pain and tenderness and different degrees of rigidity, and many times these symptoms are due to injury of the abdominal wall alone. Had I followed such teaching, I should have opened the abdomen in Cases VII, VIII, IX, X, XII, and XIII, for each of them presented pain, localized tenderness, and rigidity, and yet they all recovered without an exploratory operation.

My belief, then, is that we should wait for some symptom or symptoms indicative of intestinal injury.

Second. In the presence of shock we cannot make a diagnosis of intestinal injury, no matter how profound the shock may be or how slowly reaction takes place. We may diagnose hæmorrhage, which would lead to an immediate operation, and at the same time presume the presence of a lacerated gut, but primary shock is of itself no aid to our diagnosis. I would therefore wait for reaction to take place.

Third. No one symptom is pathognomonic of intestinal injury, but the two most reliable are gradually increasing rigidity and facial expression. In the next group I would place deep and perhaps radiating abdominal pain, respiration which becomes more and more thoracic, vomiting after the shock has ceased; distention, increasing pulse-rate, and secondary fall in temperature. The order in which I have mentioned them has no significance, for any one or two of these symptoms may be prominent to the exclusion of the others.

Fourth. Any individual who has received an abdominal contusion sufficiently severe to call for your services demands also the most careful and constant watching in order that you may detect at the earliest possible moment the appearance of grave symptoms. I do not mean that we should wait for these symptoms to become so pronounced that a positive diagnosis is assured, for then operation is for the most part too late. There is a position, however, midway between operating on every case and waiting for an assured diagnosis, where we can say that, owing to the gradual appearance of certain symptoms, we have fair reasons to think the intestinal tract may be injured, and that under such circumstances an immediate operation will give the patient the best chance. In such a case we must not forget the possibility of perforation taking place hours or even days after the injury.

Lastly. As our individual experience increases, we gain the power to place a more just value upon the symptoms present and to perceive the grave symptoms in their early stages. In other words, we gain in acuteness of perception, and there is scarcely any injury to the body which requires this more for a successful result.

HEPATIC DUCT STONES.

WITH REPORT OF A RECENT OPERATED CASE.

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A REVIEW of the somewhat extensive literature of gall-stone disease discloses the fact that not more than 70 per cent. of operations for the removal of calculi from the gall-bladder are uncomplicated.

The complications, eliminating carcinoma, adhesions, intestinal obstruction, hepatic abscess, impinging tumors, empyema or gangrene of the gall-bladder, and referring solely to stones in the bile ducts, appear in fully 15 per cent. of the reported operations for gall-stones.

It is unquestionably a certainty that stones are formed in the bile passages as well as in the gall-bladder; most frequently in the cystic and common ducts, very rarely in the hepatic duct, and still more rarely in the small divisions of the hepatic duct, or liver substance. That the formation of calculi in the ducts is dependent upon primary pathology in the gall-bladder, and not altogether upon local abnormal conditions, is an open question, and one which has an extremely important bearing upon the future of gall-stone surgery. It is certain that a neglected case of gall-stone disease offers not only the possibility of the passage of stones from the gall-bladder into the cystic or common duct, there to become lodged and subsequently enlarged, but the further possibility that stones may be directly formed in the bile passages, a possibility which goes nearer and nearer to certainty as the case progresses without surgical intervention.

In operative cases reported, stones had been found in the bile ducts—with or without calculi in the gall-bladder—in order of frequency as follows:

- (1) Stones in the cystic duct;
- (2) Stones in the cystic and common ducts;
- (3) In the common duct only;
- (4) In the cystic, common, and hepatic ducts.

A fifth classification should be, stones in the hepatic duct only. I find no reported cases of isolated stone or stones in the hepaticus, and cases of calculi in either the hepatic duct or its primary divisions or small branches associated with stones in the common or cystic ducts, or both, are rare.

Mayo, in his series of 326 operations, mentions having found stones in the hepatic duct in but five cases, all associated with others in the cystic or common ducts.

Ochsner, in reporting forty-eight cases, does not mention stones in the hepaticus.

Mayo Robson, in his report of 305 cases ("Diseases of the Gall-Bladder and Bile Ducts"), cites but four instances of hepatic duct stones, all of which were associated with calculi in the common duct. In Case 236, the common duct was opened and a finger passed into the hepatic duct, stones felt, and removed with the scoop. Case 113, stones were removed from the cystic duct, evidently through the opening in the gall-bladder, and "several crushed in the common and hepatic ducts."

Case 179. Numerous stones in gall-bladder and the three ducts; those which could not be "milked" into the gall-bladder were crushed.

Case 217. Common duct incised and stones removed. Other stones evidently small were felt in the hepaticus, and removed with the small scoop through the opening in the common duct.

Kehr, whose work on "Gall-Stone Disease" is based on 547 operations, makes specific mention of but three instances of stones in the hepatic duct, although he has repeatedly employed hepatic drainage by tube through a common duct opening. He notes a case of a series of stones in the common and hepatic ducts in which the common duct was opened and calculi removed by "tedious extraction." A drainage tube was

placed in the hepaticus. The case did badly after operation; bile, "evil-smelling and muddy," with symptoms of stones still remaining in the hepatic duct. The tube was removed and replaced after irrigation of the duct. The stone which had remained in the hepaticus was removed by the washing process on the fourteenth day, the duct having previously been tamponed with gauze, to move the stone down by pressure of bile from above. Drainage and irrigation of hepaticus continued with eventual recovery. He mentions a second case of large stones in the common, and smaller stones in the hepatic; and a third of stones in the gall-bladder and the three large ducts, in both of which cases the calculi were removed through an incision in the common duct.

Jacobsen notes a case of Thornton's in which 412 stones were found, "a majority lying in a cavity in the liver substance" with large impacted stones in the common duct, and others in the hepatic duct and upward in the liver.

Ross mentions a case of "medium-sized stones lying in a row in the hepatic duct" which "milked" through the cystic duct into the gall-bladder and removed.

Morison reports case of stones in the gall-bladder, common and hepatic ducts; cholecystostomy and choledochotomy were performed, the common duct evidently being the site of latter procedure.

Author's Case. Referred by Dr. R. C. Cupler, to whom I am indebted for details of preoperative history and after treatment.

Mrs. R., German, aged forty-one years, weight something over 200 pounds; disposition decidedly neurotic. Family history negative; no remembrance of any relative suffering from cholelithiasis. Has had six children, four living at present. Patient had always been in good health with exception of the ordinary diseases of childhood, including scarlet fever, until twenty years of age, when her first child was born. A few months after labor she was seized with severe abdominal pains; a physician was called and morphine administered. The pain was relieved, but on the following day the patient suffered from anorexia, nausea,

and vomiting, and noticed a coloring of the skin (jaundice). Like attacks of colic followed each succeeding pregnancy with some few seizures between.

During the two years previous to operation she had many attacks of colic with no jaundice, and had a constant pain under the right scapula. Had a troublesome cough for past five years, at times a brisk hæmoptysis, nocturnal dyspnoea, shortness of breath on exertion. Had facial neuralgia and migraine at times for the past fifteen years. For the shoulder pain, hemicrania, and abdominal pains, she had been taking daily from two to six neuralgia pills with morphine. During the attacks of colic, pain was apparently in epigastrium, radiating to right scapula. Had been troubled with insomnia. Menstrual history negative; no abortions or miscarriages; bowels only occasionally constipated.

Physical examination revealed large pendulous abdomen, wall extremely obese. Liver somewhat low, not sensitive on pressure or percussion. No points of abdominal tenderness except centre of epigastrium; no tenderness over gall-bladder, with apparently no pain on deep palpation or "prodding."

Chest. Respiration, 10; chest barrel-shaped, with widened intercostal spaces; slight expansion on deep inspiration. Resonance increased, upper line of liver-dulness low. Heart-dulness indistinct; heart sounds generally weak. Breath sounds enfeebled. Sibilant râles.

Bimanual examination of pelvis revealed enlarged and tender left ovary, uterus retroflexed, cervical tear, perineal floor relaxed.

Hæmorrhoids present. Few palpable inguinal, axillary, or cervical glands. Skin moist and clear. Pulse, 90, regular, soft. Temperature, 99° F. Urine showed indican only.

Diagnosis. Gall-stones, probably involving common duct as principal trouble; based on clinical history.

Operation made under chloroform anæsthesia, July 26, 1902. Incision parallel to rectus downward from tip of tenth costal cartilage. Fat two to three inches in thickness. Straight incision through muscles and peritoneum. Immediately upon dividing the peritoneum, the gall-bladder presented in upper angle of the wound, and was easily delivered. It was fully six inches in length and much distended. Palpation revealed three stones,—two floating about, and one apparently blocking the entrance to the cystic duct.

Deep palpation showed the cystic and common ducts apparently clear. Surrounding tissues and viscera normal. A concretion, size of a pigeon's egg, was felt high up under the liver in the gastrohepatic omentum. On account of the great depth, due to the thick abdominal wall and the location of the concretion, I was unable at this stage to determine its exact locality and relations.

The stone blocking the cystic duct was readily milked into the gall-bladder. This stone evidently acted as a "Fenger ball-valve," and to it I attribute the retention of bile in gall-bladder and the subsequent distention.

The abdominal cavity was carefully walled off with gauze packs, the gall-bladder surrounded with pads, opened and emptied of bile. The three stones, each the size of a marble (weight, thirty-five grains) and with six facets, were easily removed with the scoop. Bile was clear and without odor. No sign of cholecystitis.

After clearing the gall-bladder, it was thoroughly washed out with normal salt solution, wrapped in clean gauze, and drawn out and over the upper angle of the wound.

The abdominal incision was then lengthened downward until about eight inches in length through skin and fat, and five inches through muscle and peritoneum,—parenthetically, this I believe to be an important point in the technique of abdominal surgery. There being no particular value or strength in the skin and superficial tissues, the length of the external incision is immaterial. In operating upon an obese patient, by making a long incision through skin, superficial fascia, and fat, with these tissues well retracted, the operator has practically a thin wall to work upon, and a short incision through the deep fascia, muscle, and peritoneum will suffice.

With the incision enlarged, the liver was lifted up, colon retracted downward, and stomach and duodenum carried downward and to the left as far as possible, thus placing some traction on the gastrohepatic omentum.

The field was again thoroughly walled off by gauze pads, which together with the viscera were held in place by long retractors.

A careful examination showed the common duct clear; the cystic duct was palpated from its origin downward to its union

with the common duct, and proved to be free from calculi. The large concretion proved to be a stone in the hepatic duct, lying with its lower extremity about half an inch above the junction of hepatic and cystic. The duct was apparently sacculated, the stone being freely movable upward and downward for the distance of half an inch, and could also be rotated on its long axis. There was no impaction and evidently no obstruction to the biliary current. The hepatic duct was not enlarged below the stone, and was clear above.

It was found impossible to "milk" the stone downward, and an attempt to crush the calculus proved ineffectual. At the anterior border of the lower end of the stone appeared a sharp, knife-like edge, over which the tissues were very thin, and showing that perforation was imminent.

An incision was made through the omentum and duct wall directly down upon the stone, keeping a trifle to the right to avoid possible injury to the hepatic artery or portal vein. The stone was then delivered lower end foremost. The stone was non-faceted, hard, but not particularly heavy, weighing 250 grains, and measuring in length one and three-fourths inches and three and one-fourth inches in circumference.

Because of the condition of the biliary passages, I did not think hepatic drainage necessary or advisable, so proceeded to suture the duct. Lembert sutures were placed in the duct wall at the extreme upper and lower angles of the incision. These, when tied with the ends left long, served as traction sutures, and held in long forceps by an assistant greatly facilitated the remainder of the sewing. The wound in the duct was closed with interlocking sutures (*i.e.*, author's interlocked Halsted stitch) of fine catgut, a small, fine curved needle being used. Over the line of union thus formed the peritoneum was closed by a continuous right-angled Cushing suture of 00 catgut. Field of operation wiped clean and packing removed. Two inches of upper portion of gall-bladder were then cut away, and cut edges of the viscus sutured to the parietal peritoneum in the usual manner with interrupted sutures of catgut. Remaining peritoneum closed by continuous suture. Muscle and fascia united with interrupted catgut. A rubber drainage tube was placed into the gall-bladder, iodoform gauze being wound about the tube from the peritoneal level outward. Skin and superficial tissues closed with silkworm gut,

and a dressing of fluffed gauze, rubber dam through which the tube emerged, and combination pads applied.

Upon awakening from the anæsthetic, patient complained of much pain, which was constant for forty-eight hours, when it became intense, with abdomen distended, tympanitic, and very tender. Pulse, 140; temperature, 103° F. The tube was elevated, it evidently having caused some pressure pain. Hot turpentine stupes constantly applied to abdomen. Insertion of rectal tube was followed by return of good deal of flatus. Patient improved in every way the following (third) day. Tube drained freely. Bile clear and sweet; daily dressings; on the sixth day the tube was removed and iodoform gauze drainage substituted. Uneventful course, with daily dressings for five weeks, when patient left hospital. Small sinus remained, discharging small amount of bile. The sinus closed during the sixth week, but on the second day following the closure patient had a severe attack of colicky pain, which lasted several hours. The sinus opened spontaneously with an expulsion of bile sufficient to saturate dressings and clothes. The sinus was gently curetted and healed promptly. There has been no further trouble, discomfort, or pain. The patient is now (January, 1903) in excellent condition, and complains only of a cough, which is not so distressing as before operation, and an occasional attack of nocturnal asthma.

In my work upon some hundreds of cadavers, in many of which gall-stones were present, I recall but one instance of calculi in the hepaticus, either alone or associated with stones in the other passages. In that subject a large isolated stone was found in the hepatic duct during the course of a demonstration of the operation of choledochotomy at the Post-Graduate Laboratory, by Dr. Paul Gronnerud, who has kindly furnished me with the following description:

" Subject, female cadaver about forty years of age; death due to pulmonary tuberculosis.

" Region of liver and gall-bladder apparently normal, no adhesions or sign of disease of contiguous viscera. The gall-bladder was empty and small; a probe was easily passed from the gall-bladder through the cystic duct, demonstrating no stricture or obstruction of that passage. Palpation and later dissection

showed the choledochus normal and unobstructed throughout its course. There was no sign of inflammatory changes in the gall-bladder, cystic or common ducts. The hepatic duct, however, contained a single stone, situated immediately above the junction of the hepatic with the cystic ducts. The stone was movable—upward, downward, and to each side—for a short distance. It was contained in a pouch-like enlargement of the hepaticus, and evidently had not offered obstruction to the flow of bile.

“Upon opening the common duct, a probe could be passed beyond the stone into the right and left divisions of the hepaticus.

“The calculus was smooth, hard, and round, non-faceted, and somewhat larger than a common marble. Could not crush the stone or force it downward. Post-mortem rigidity of the duct wall probably prevented the latter procedure. The calculus was removed through an hepatic duct incision, which was closed by interlocking sutures. There were no further concretions in the hepatic duct, its branches, or in the liver. A small amount of biliary sand was, however, found in the liver substance.”

The conditions found will be seen to closely resemble those in my own operative case, with the exception that in the cadaver there were no stones in the gall-bladder and no dilatation of that viscus. In both instances the common duct was patent.

While it is undoubtedly true that in a majority of cases of stones in the hepatic duct the condition is due to an obstructed or impacted common duct, thereby forcing stones which have formed in and passed from the gall-bladder upward, these cases of isolated hepatic stones add their modicum of proof to the hypothesis of the local formation of calculi in the bile passages.

A consideration of hepatic duct stones inevitably brings out prominently three points, namely, (1) that the possibility of such locality of calculi should not be overlooked; (2) methods of operative technic, and (3) the question as to whether or not the presence of stones in the bile ducts is dependent upon a pathological gall-bladder or pathological conditions within that viscus.

The operation of incising the abdominal wall and immediate suture of gall-bladder to the parietal peritoneum, without

first carefully examining, not only the cystic, common, and hepatic ducts, but the contiguous viscera and tissues, and, in the light of recent disclosures, the vermiform appendix as well cannot be too strongly condemned.

The rarity of calculi in the hepatic ducts apparently justifies the standard text-books in omitting more than mere mention of the operative technique of this condition; a majority of works omit the subject altogether.

Richardson, in Park's "Surgery," states that "operations upon the hepatic and common ducts are indicated when stones are impacted in either, and cannot be removed by dilatation of the cystic duct, or by reasonable efforts at crushing" after incision, closure of the ducts by suture.

Mayo Robson states that "if a gall-stone be found in the hepatic duct, it may be reached by opening the common duct and passing scoop or forceps through this opening."

Kehr describes a like procedure. Robson, however, has been fortunate in having been able to crush stones *in situ*. I believe that the hepatic duct as readily admits of successful operative procedures as the common or cystic. Its anatomical position, however, presents technical difficulties which may be surmounted by a long straight incision through the abdominal wall, upward traction on liver, and a clear field provided by proper placing of packs, and use of long retractors.

In cases of hepatic calculi, (1) an attempt should be made to "milk" the stones through the cystic duct into the gall-bladder; (2) "reasonable efforts should be made to crush the stones," though the advisability of this procedure may be questioned in cases of numerous stones, on the ground that small pieces might remain in the duct and form the nucleus of further concretions. (3) In cases of calculi in both common and hepatic ducts, if the stones are small, an incision in the common duct will admit of the removal of the stones from both passages, the upper stones being brought down by scoop or forceps. (4) Direct incision of the hepatic duct should be made in cases where it is found impossible to "milk" or crush the stones; where it is apparently impossible to force the calculi down into the common duct, and in cases of large isolated stone.

After incision of the hepatic duct, the vitally important question as to suture or drainage must be decided by the exigencies of each individual case, and just in this connection the question of the formation of calculi being dependent wholly upon pathological processes within the gall-bladder only has a most important bearing. There is no doubt but that the common or hepatic duct may be closed with perfect success in certain cases; but I should hesitate to close either the hepatic or common duct when numerous stones have been removed from these ducts, even should cholecystectomy be performed. In cases of cholangitis, drainage of the hepaticus always! and whenever, according to Kehr, the bile is "evil-smelling and muddy."

It seems safer to assume that stones may be formed in the bile ducts independently of gall-bladder influences; and arguing upon that assumption, unless the case is undoubtedly uncomplicated, or one with a few or a single large stone in the ducts, with no sign of cholangitis, and with the bile clear, simple drainage of the gall-bladder, removal of mucous membrane, and cholecystectomy may all prove insufficient, and drainage of the hepatic duct by tube through a direct incision or common duct opening should be instituted.

Kehr's large experience impels him to say, "Advance will only be made in the operative treatment of gall-stone disease when we treat the cystic, common, and hepatic ducts as we now do the gall-bladder, viz., open and drain."

PRIMARY CARCINOMA OF THE VERMIFORM APPENDIX, WITH A REPORT OF THREE CASES.¹

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THE exceedingly infrequent occurrence of primary malignant neoplasms of the vermiform appendix has long been a subject of comment among surgeons and pathologists. In the voluminous literature devoted to diseases of the appendix there are but comparatively few references to malignant diseases of this organ, and some of these are decidedly unauthentic. This appears to be especially true of the earlier cases reported. In order that some idea may be gained as to the accuracy of these observations, the writer has taken the trouble to look up the original reports, where such exist, of practically all the cases in the literature.

The first reference to carcinoma of the appendix is a case reported by Merling¹ in 1838. The report was of the findings at an autopsy upon a case which had died of general peritonitis. The wall of the appendix was thickened, scirrhous, and of a grayish-brown color. Furthermore, it appeared to be occupied by several small hard tumors. Near the attachment to the cæcum the appendix presented a small ragged opening the size of a pea, through which the intestinal contents had escaped into the peritoneal cavity. Although assumed to be a case of primary carcinoma of the appendix, no mention was made of a microscopical examination, and it would appear to be much more probable that it was a case of perforative appendicitis.

The next mention of primary carcinoma of the appendix

¹ Read before the New York State Medical Society, January 28, 1903.

was a case reported by Prus,² in 1865, of a woman of seventy-five years of age who died with symptoms of general peritonitis. At autopsy the peritonitis was found to have originated from a large perforation of the wall of the appendix. The mucous and muscular walls of the appendix were thickened. From the base of the ulceration about the perforation there sprang a small, soft sessile tumor, which on section showed some hæmorrhage. No mention was made of a microscopical examination, and it would also appear that this case was not one of primary carcinoma of the appendix.

The first important article upon the subject was that of Rokitsansky,³ who in 1867 reported four cases of what he believed to be primary carcinoma of the appendix. He called attention to the fact that prior to that time carcinomatous degeneration of the appendix had been scarcely recognized among the diseases of that organ.

The first case, which was observed in 1847, was that of an individual eighty-two years of age who died of pulmonary disease. At autopsy the appendix was found to be transformed into a sac six inches in length and two inches in diameter. It was situated to the outer and posterior side of the cæcum, to which it was densely adherent, and into the lumen of which it had caused a projection. The walls of the appendix appeared fibrous in character and the cæcal orifice of the appendix was obliterated. The sac which represented the degenerated appendix contained a yellowish white, opaque, gelatinous mass, which was streaked with blood. The wall of the sac consisted of fibrous tissue which had completely replaced the mucous and muscular coats, and upon the inner surface presented an areolated, reticulated appearance, the reticulæ traversing the gelatinous material and dividing it more or less into compartments.

The second case, observed in 1854, was that of an individual sixty-eight years of age who died of pneumonia. The appendix was two inches in length, and the distal two-thirds was transformed into a spindle-shaped fibrous sac about the size of a pigeon's egg, which contained a yellowish gelatinous material traversed by fine reticulated processes which took their origin from the wall of the sac.

The third case, observed in 1866, was that of an individual seventy years of age who died of heart disease. The appendix was four inches in length, and the distal, 2.9 inches, was transformed into a sac distended with a gray gelatinous material. This portion of the appendix was about one inch in diameter, and the wall, which was one-tenth of an inch in thickness, was of a fibrous character. The entire surface of this sac was smooth in some places, while in others it was irregular, and from it numerous delicate processes ran in different directions through the gelatinous material.

The fourth case, observed in 1866, was that of an individual thirty-eight years of age who died of pulmonary and intestinal tuberculosis. The appendix was 1.9 inches in length and consisted of two compartments. The distal, lined by a smooth mucosa, contained a grayish gelatinous material, while the proximal compartment was distended with a gelatinous material traversed by numerous delicate strands of tissue, which appeared to originate from the fibrous wall of the compartment. The walls of the appendix in this region appeared to be transformed into fibrous tissue.

Rokitansky concludes that this disease of the appendix consists of a stenosing colloid carcinomatous degeneration, which results in an enlargement and distortion of the organ and the transformation of its wall into a fibrous capsule. There is no discussion of the microscopical appearances of any of these specimens, and, hence, there is some question as to whether they were really instances of carcinoma, and not mucoïd degeneration or dropsy of the appendix.

Kolaczek,⁴ in 1875, reported a case of abscess in the right iliac fossa which opened and the fistula failed to heal. At autopsy a carcinoma of the cæcum was found, which connected with the fistula. The base of the appendix opened at the site of the ulcerated carcinoma, but no mention was made of involvement of the appendix.

This case is here mentioned because of the fact that it has been frequently referred to in the literature as an instance of primary carcinoma of the appendix, when it was very evidently an instance of primary carcinoma of the cæcum.

Leichtenstern,⁵ in 1876, briefly mentioned statistically the observation of three carcinomata of the appendix. No mention, however, of the character of the neoplasms was made other than that they were carcinomata.

Bierhoff,⁶ in 1880, reported a case of a woman of seventy-eight years who presented at autopsy carcinoma of the uterus and left ovary, as well as of the rectum, with metastatic nodules in the liver and spleen. The appendix was normal for three centimetres of the proximal portion. Three centimetres from the base was situated a carcinomatous nodule the size of a hazel-nut. This nodule produced an obstruction of the lumen such that the distal portion of the appendix was distended into a tense sac containing a grayish mucoid material. This case is here referred to because it, too, has been frequently quoted as an instance of primary carcinoma of the appendix, while in all probability the involvement of the appendix was secondary.

Beger,⁷ in 1882, reported a case of considerable interest. The patient, a man of forty-seven years, developed three and one-half years previously a tumor in the right inguinal region, which was incised and about a litre of pus evacuated. The wound, however, never closed. No fæcal gases or intestinal contents appear to have escaped through the fistula. At operation the appendix was found attached by its tip to the base of the fistula, and occupied throughout its entire extent by a carcinomatous process. It was six centimetres in length and about the thickness of the finger. At the base of the appendix was a walnut-sized papillary tumor projecting into the cæcum, which presented the same structure as the rest of the new growth, and had evidently resulted from extension along the appendix. The patient died thirty-six hours after the operation, and at autopsy metastatic involvement of the retroperitoneal glands was found. Microscopical examination of the new growth showed it to be an adenocarcinoma. The writer believed the carcinoma to have begun at the tip and to have gradually extended to the base of the appendix. The case was of especial interest because of the absence of intestinal symptoms in spite of the existence of the tumor for so long a time.

Maydl,⁸ in 1883, mentions one case of carcinoma of the appendix in an article upon intestinal carcinoma. No further men-

tion was made, however, of the gross or microscopical appearances of the tumor.

Draper,⁹ in 1884, reported a case of a man of sixty-five years who died with obscure abdominal symptoms which did not allow of a clinical diagnosis. At autopsy the ileum above the ileocaecal valve was distended with liquid fæces. Just at the valve, upon its upper surface, three foreign bodies—two small fragments of bone and a prune-stone—were found lying loosely before the opening into the cæcum. The valve was constricted so as to admit the tip of the index-finger only with difficulty. The mucous membrane of the cæcum and lower part of the ascending colon was thickened and deeply reddened, but not ulcerated. The upper third or head of the appendix was enlarged and dilated to about the size of a large plum. The opening of the appendix into the intestine was also dilated. The thickened wall of this enlarged portion of the appendix presented the characteristic appearances of colloid disease. The free end of the appendix beyond the dilated portion was very slightly enlarged and contained inspissated faecal matter. The peritoneum and subperitoneal tissues adjacent to the new growth were normal.

In this case there would appear to be a reasonable question as to whether the neoplasm may not have been primary about the ileocaecal valve and to have involved the appendix secondarily.

Lafforgue,¹⁰ in 1893, presented an interesting thesis upon primary tumors of the appendix in which several cases in the literature were discussed and the clinical features of the disease were presented. The writer did not, however, report any additional cases.

Glazebrook,¹¹ in 1895, reported a case of so-called endothelial sarcoma of the appendix, which, because of the as yet unsettled relationship of these tumors to carcinoma, will be briefly referred to. The patient, a man of fifty-five years, died of cerebral hæmorrhage. At autopsy the appendix was in a normal situation, but bound down by dense adhesions. It was of normal size for three inches from the proximal end, at which point there was an enlargement the size and shape of a pigeon's egg, situated in the anterior wall of the appendix. The mass was hard and fibrous and resembled a scirrhus tumor. After microscopical examination, the tumor was said to be an endothelial sarcoma, the walls of the appendix being infiltrated by nests of irregular cuboidal or

cylindrical cells which were thought to be of endothelial origin. There were no evidences of metastases.

Stimson,¹² in 1896, reported a case of carcinoma of the appendix in a woman forty-four years of age, who had had a very severe attack of appendicitis ten years previously. She remained well until two months before operation, when she had a mild attack and recovered. Another mild attack led to an operation and the removal of the appendix, which was four inches in length and one inch in thickness, and presented a degenerated carcinoma, the type of which was not mentioned.

Letulle and Weinberg,¹³ in 1897, presented a brief discussion of the subject of obliterating appendicitis, based upon the study of twelve cases, two of which presented primary carcinomata of the appendix. They called especial attention to the development of carcinoma in the fibrous cicatrix of an obliterated appendix and the involvement of all the layers of the appendix by the carcinoma. In one of their cases, both of which occurred in individuals dead of tuberculosis, they were able to demonstrate the starting-point of the carcinoma at the line of fusion where the lumen had been obliterated. In this case the carcinoma had extended from this point through the different layers to the peritoneum. In the second case the terminal extremity of the appendix was the seat of a peculiar adenomatous hypertrophy. The carcinoma had begun in the scar and had involved all the coats of the appendix.

Mossé and Daunic,¹⁴ in 1897, reported a case of primary carcinoma of the appendix, found at autopsy upon a woman fifty years of age, dead of heart disease. There had been, so far as was known, no symptoms of appendicular disease. The appendix pointed downward and inward, was free from adhesions, and was provided with a normal-looking mesentery. It was four centimetres in length and much thicker than normal, having a maximum circumference of forty-five millimetres, cylindrical in shape, about the size of a date and largest at its free extremity. The consistency was firm and the surface smooth. The tumor was entirely confined to the appendix, and was situated for the most part in the mucosa, and in the centre of the growth was the lumen, which was much reduced in size. The mucosa was quite extensively invaded, the musculature less so, while the peritoneum appeared to be uninvolved. In the vicinity of the lumen vestiges

of the glands of Lieberkühn could be made out, some of which had undergone carcinomatous degeneration and seemed to have been the starting-point of the tumor. In portions of the section the tumor presented the appearance of a cylindrical-cell carcinoma, while in other portions it presented more of an alveolar arrangement. The absence of foci in the cæcum, lymphatic glands, and the other viscera led the writer to assume the tumor to be a primary carcinoma of the appendix.

Wright,¹⁵ in 1898, reported an autopsy upon a case of general peritonitis of obscure origin. The autopsy failed to reveal any definite starting-point of the peritonitis. There were some adhesions about the appendix, but no definite evidence of perforation. Upon microscopical examination of the appendix a small primary carcinoma of the head of the organ was found, and just at the junction of the tumor with the wall of the gut was a small perforation which was doubtless the starting-point of the peritonitis. The tumor presented the microscopical appearances of a typical adenocarcinoma.

Monks,¹⁶ in 1899, reported a case of tumor involving the cæcum, in the middle of which there was a slough which seemed to represent the appendix. The tumor proved to be a carcinoma and was undoubtedly primary in the cæcum, with possibly secondary involvement of the appendix. Reference is made to this case because it has been erroneously quoted as an instance of primary carcinoma of the appendix.

Nothnagel,¹⁷ in 1898, briefly mentioned one case of carcinoma of the appendix observed in the Pathological Institute of the general hospital at Vienna. There was, however, no discussion of the characteristics of the case.

Zeman, of Vienna, has also mentioned statistically a case of carcinoma of the appendix, which, however, may be a case already referred to.

Hurdon,¹⁸ in 1900, reported a case of a woman of twenty-four years, who, since the birth of her first child eight years previously, had had considerable pain in the lower abdomen and back, associated latterly with a constant aching in the right lumbar region. The uterus was found to be acutely retroflexed and operation advised. At operation the appendix was found to project downward over the brim of the pelvis and to be involved in dense adhesions. The appendix was removed, and the patient made a

good recovery. The appendix, which was ten centimetres in length, was found to be acutely flexed upon itself at about the junction of the middle and distal thirds. The proximal end was normal, but the distal end beyond the flexion was distended, and contained a soft concretion about the size of a date-stone. Joining the distended extremity to the normal proximal portion was an intermediary portion one and one-half centimetres in length, and of very firm consistence. This on section was found to be a small oval tumor ten by five millimetres, which had produced a marked stenosis of the lumen. Histologically, the tumor proved to be an adenocarcinoma which had invaded all the coats of the appendix. The patient was in excellent health at the time the report was made.

Letulle and Weinberg,¹⁹ in a communication to the Anatomical Society of Paris in 1900, reported two additional cases of primary carcinoma of the appendix complicating chronic appendicitis. In the first case the carcinoma was discovered more or less accidentally in the course of an autopsy upon an individual who had died of tuberculosis. The second case was a child of twelve years of age operated upon by Jalaguier. The patient had had several attacks of appendicitis. The carcinoma, which was of the adenomatous type, was located at a point of the appendix at which a stenosis had resulted from the chronic inflammatory process. The rest of the appendix presented the usual appearance of acute appendicitis. The patient made a good recovery.

Giscard,²⁰ in 1900, reported a case of a man of thirty-seven years who in March, 1898, had his first attack, which was mild in character. In October of the same year he had a second attack, and after several days developed grave symptoms, which led to an operation. An abscess of the right iliac fossa was found with local peritonitis. The appendix was situated behind and to the inside of the cæcum. The patient made a good recovery. The appendix was about the size of a crayon of chalk, and the lumen was obstructed at about the middle of the organ by what appeared to be a cicatricial thickening. In the distal end of the appendix there was some pus. Histological examination of the appendix showed both a catarrhal and chronic inflammation. At one point the sections also showed a narrowing of the lumen by a neoplasm situated between the mucosa and musculature. This growth occupied about one-half of the circumference of the appendix, and

caused a projection towards the lumen as well as towards the periphery. The carcinoma seemed to originate from the deeper layer of the glands, and in its superficial portion presented the characteristics of an adenocarcinoma, while in the deeper portion it resembled an alveolar carcinoma with cylindrical cells.

Rolleston,²¹ in 1900, reported a case of a woman twenty-six years of age, operated upon during a fourth attack of appendicitis, the previous three attacks having occurred within a period of fifteen months. The appendix was slightly adherent to the posterior wall of the uterus, and on section presented a globular mass a little larger than a marble, and situated near the tip. This mass presented a caseous appearance which suggested tuberculosis. Histologically, it proved to be a spheroidal-cell carcinoma, which in places appeared to extend almost to the peritoneum. The growth was undoubtedly primary in the mucosa. Several months after the operation the patient was reported to be in poor health, and the probability of secondary growths was entertained.

Whipham,²² in 1901, reported a case of a woman of forty-five years who was admitted to St. George's Hospital with great enlargement of the abdomen and a tumor in the left iliac fossa. Operation was deemed inadvisable, and the patient died four weeks later. At autopsy the abdomen was found to contain a large quantity of serous fluid. The peritoneum over both the parietes and viscera was thickly studded with nodules of new growth. One or two nodules were found in the liver, and the left ovary was transformed into a mass of new growth measuring six by four inches. The lymphatic glands of the neck and anterior mediastinum were also involved. The mucous membrane of the entire alimentary tract was normal, with the exception of a small portion at the base of the appendix, which was occupied by a new growth. The neoplasm proved to be a spheroidal-cell carcinoma. The writer assumed the neoplasm to be primary in the appendix because of the absence of new growths elsewhere in the alimentary tract, and also because the growth was most marked in the mucosa and submucosa, and invaded the muscular coats of the appendix but slightly. The reasons for the assumption that this was a primary carcinoma of the appendix do not appear to be by any means valid, and it is much more probable that the growth originated in the left ovary and metastasized to the appendix.

McBurney,²³ in 1901, reported two cases of primary carcinoma of the appendix. The first was a case of a woman twenty-three years of age, who had had a severe attack of appendicitis two years previously. The symptoms subsided in ten days, and the patient remained well except for a feeling of pain and discomfort in the right iliac fossa on movement or active exercise. Two months before operation the pain became very severe and incapacitated the patient, without rise of temperature or pulse. On examination the patient appeared to be in good health, but the appendix was very sensitive. At operation the appendix was found free from adhesions or disturbance of the peritoneal surface. The organ was four inches in length, much thickened and enlarged, and presented two strictures, one near the base and one near the tip. Near the tip was a small tumor about the size of a green pea, of dense consistency and white color, which microscopically proved to be a pure carcinoma. There was no evidence of malignant disease elsewhere in the body. The second case was of a man of about thirty years who had given no history of appendicitis. At autopsy the appendix was found to present a rounded tumor near the tip. This tumor was considerably larger than that in the first case, and microscopically was found to be a pure carcinoma resembling the first specimen.

Goffe,²⁴ in 1901, reported a case of a Jewess of fifteen years, well developed and well nourished, who for more than a year had complained of pain in the region of the appendix after exercise. A clinical diagnosis of chronic appendicitis was made and the organ removed. The appendix was unusually long, thickened, and tortuous, and in the extreme tip was a small white tumor the size of a large pea. Microscopically, the tumor resembled a fibroma, and appeared to have developed in the wall of the appendix and protruded into the lumen. Histologically, it was found to be a carcinoma, which did not, however, invade the muscular coats.

Kelly,²⁵ in 1901, reported three cases of primary carcinoma and one case of primary endothelioma of the appendix. In the first case the appendix presented the usual character of acute ulcerative appendicitis. At about the junction of the middle and distal thirds was a tumor six millimetres in diameter, occupying chiefly the mucosa and submucosa, and microscopically of the type of carcinoma simplex. The second case was that of an indi-

vidual twenty-four years of age, with a history of four attacks of appendicitis in the year previous to operation. At operation the appendix was free from adhesions, nine centimetres in length and from five to seven millimetres in diameter. There was no macroscopical evidence of tumor formation; microscopically, however, there was an area near the base of the organ which presented an appearance which the writer considered to be endothelioma. The description of the specimen, together with the uncertain position of this group of tumors, leaves some doubt as to whether this may not have been a case of carcinoma rather than endothelioma. The third case was that of a man of nineteen years who had always been strong and well. Eight days before admission to the hospital he had been taken with severe abdominal pain, which localized itself in the right iliac fossa, where a mass about three inches in diameter could be felt. At operation a collection of pus was found around the head of the cæcum and the base of the appendix. The appendix was five centimetres in length and one centimetre in diameter. Histologically, the organ presented the lesions of ulcerative appendicitis, in addition to which there was a small growth situated near the base of the appendix. The growth, which was of the type of carcinoma simplex, was located almost entirely within the submucosa, although in a few places there was a slight infiltration of the muscular coats. The fourth case was of a man of sixty-three years, who had always been well until a short time before admission to the hospital, when he began to have attacks of rather severe pain in the right iliac fossa. At operation the appendix was found to be adherent to the surrounding structures, and both the appendix and intestines were studded with numerous whitish nodules suggestive of miliary tubercles. The retroperitoneal glands were also enlarged. The patient died seven days after operation, but no autopsy was obtained. The appendix was two centimetres in length and varied in diameter from one to two centimetres. It presented a constriction at about the middle. Microscopically, the lumen was obliterated, and there was no evidence of a mucous membrane in any part of the organ. The submucosa, muscularis, and peritoneum were infiltrated with nests of carcinoma cells. The meso-appendix was similarly infiltrated. The writer suggests the possibility that the appendix was involved secondarily to carcinoma somewhere else in the body; but the absence of the mucosa and the arrangement of the car-

cinoma cells inclined him to the view that the growth was primary in the appendix. In view of the fact, however, that there was general peritoneal involvement which was also evident upon the surface of the appendix, together with involvement of the retro-peritoneal glands, it would seem very much more probable that the growth in the appendix was secondary to a neoplasm elsewhere in the body.

Harte and Willson,²⁶ in 1902, have reported two cases of primary carcinoma of the appendix. The first case was of a woman of twenty-four years, who at the age of nineteen had an attack of what appeared to be appendicitis, from which she recovered and remained well for four years, when she had another attack. For several months prior to the operation she had had more or less pain in the region of the appendix. On physical examination there was abnormal sensitiveness in the right iliac fossa and some thickening of the tissues about the appendix. At operation the appendix was found to be free from adhesions and to project upward behind the cæcum. It was fifteen centimetres in length, contained two small concretions, and appeared normal to the naked eye. The lumen was, however, obliterated for almost the entire length of the organ. On physical examination a scirrhous carcinoma five millimetres in diameter was found about one centimetre from the tip. The carcinoma appeared to have originated from the remains of the glands of the mucosa and to have invaded all the coats of the appendix. The second case was of a man of twenty-five years, who for eight months prior to the operation had had more or less continuous pain in the right iliac fossa. The appendix was found to be bound down behind the cæcum by old adhesions. It contained a concretion about the size of a grape-seed and presented a perforation near the tip. Sections of the appendix about one centimetre from the tip showed a carcinoma taking its origin from the mucosa. All the coats of the appendix were involved in the growth, which was a carcinoma simplex in type. In addition, the appendix presented the gross and microscopical appearance of acute suppurative appendicitis.

Weir,²⁷ in a discussion of primary carcinoma of the appendix at the meeting of the American Surgical Association in 1902, briefly reported one case which had occurred in his practice. There was, however, no description of the gross or microscopical appearance of the tumor.

Jessup,²⁸ in 1902, reported a case of a woman of thirty-six years who had had considerable pain in the left inguinal region following an abortion. Operation was undertaken by Dr. Cleveland for disease of the uterine adnexa. A cyst of one ovary was found, and the appendix, which was bound down by adhesions, was removed. The appendix was six centimetres in length, and at the junction of the middle and distal thirds was bent at a right angle, with a constriction at the bend, beyond which was an enlargement. The diameter of this portion was one centimetre while that of the proximal portion was five millimetres. The lumen was obliterated at the bend, and the enlarged portion was occupied by a firm tumor mass, the muscular coat presenting a thin shell. Microscopical examination showed the tumor to be an adenocarcinoma which had infiltrated the mucosa, submucosa, and muscularis. The middle and proximal portions of the organ were free from new growth. There had been no symptoms pointing to disease of the appendix, and the discovery of the carcinoma was accidental.

Of the forty cases here referred to, it would appear that eight were probably not cases of primary carcinoma of the appendix. These eight comprise one case of Merling, one case of Prus, one case of Kolaczek, one case of Bierhoff, one case of Draper, one case of Monks, one case of Whipham, and one case of Kelly. To these eight cases may be added the case reported by Glazebrook as endothelial sarcoma and one reported by Kelly as endothelioma; although it would seem, from the description, that these may have been instances of primary carcinoma of the appendix. Of the remaining thirty cases there may be some question as to the authenticity of the four cases reported by Rokitansky, the three cases reported by Leichtenstern, the case reported by Maydl, the case reported by Nothnagel, and the case reported by Zeman, because in none of these cases was there a report of a microscopical examination or of positive proof that if a carcinoma existed it was necessarily primary in the appendix.

The remaining twenty cases would, however, appear to be fairly definitely proven to be instances of primary carcinoma

of the appendix. The macroscopical findings in these twenty cases are furthermore confirmed by more or less extensive descriptions of the microscopical characters of the neoplasms. These twenty cases comprise one case of Beger, one case of Stimson, one case of Mossé and Daunic, one case of Wright, one case of Hurdon, four cases of Letulle and Weinberg, one case of Giscard, one case of Rolleston, two cases of McBurney, two cases of Harte and Willson, one case of Goffe, two cases of Kelly, one case of Weir, and one case of Jessup.

To these the writer wishes to add the following three cases recently studied by himself.

CASE I, Figs. 1, 2, and 3.—W. D., male, aged eighty-one years, a patient of Dr. Vander Veer. The patient had always been strong and healthy until during the later years of life, when he had shown evidence of both pulmonary and cardiac disease, which were the immediate cause of death. There had never been any symptoms of disease of the appendix. At autopsy, the main lesions were pulmonary tuberculosis with pleural effusion upon the right side, general arterial sclerosis with hypertrophy and dilatation of the heart, chronic interstitial nephritis, and a primary neoplasm of the vermiform appendix. The appendix projected upward behind the cæcum, was free from adhesions, and measured five and one-half centimetres in length. The proximal two centimetres of the organ was of normal appearance and measured six millimetres in diameter. The distal three and one-half centimetres of the appendix was much enlarged and measured three centimetres in diameter. Projecting from the convex surface of the enlarged portion of the appendix at about the middle of the surface, opposite the mesenteric attachment, was a mass of yellowish-green, translucent, gelatinous material. This mass measured two and one-half by two and one-half by two centimetres in its diameters, and presented an irregular contour. On transverse section of the appendix through the middle of the enlarged portion, the lumen of the organ was found to be filled with a gelatinous substance resembling that already mentioned. At about the middle of the convex surface of the enlarged portion of the appendix and opposite the mesenteric attachment was a perforation one centimetre in diameter, through which the gelatinous



FIG. 1.—Case I., primary colloid carcinoma of appendix. Showing the projection of the colloid material through a perforation of the organ. (Natural size.)

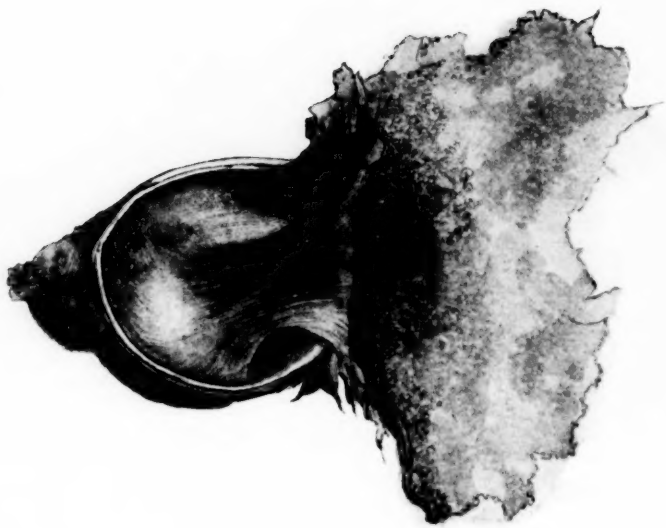


FIG. 2.—Case 1., primary colloid carcinoma of appendix. Transverse section through the appendix in the region of the perforation. (Natural size.)

material in the lumen of the organ was continuous with that already described as attached to the surface. The perforation was definitely circumscribed and the edges were rather firm. There was no evidence of necrosis of the tissue about the perforation. The gelatinous substance within the appendix presented a striated appearance, the striæ tending to converge towards the perforation. This gelatinous material could be readily detached from the wall of the appendix, and in places presented a decidedly lamellated appearance in addition to the striation already mentioned, and the consistence was about that of calves'-foot jelly. The wall of the appendix, except in the region of the perforation, appeared distinctly thickened, and presented the appearance of an hypertrophy of the musculature. Careful examination of all the other viscera of the body, as well as of the regionary lymphatic glands, failed to reveal any other focus of new growth.

Microscopical examination of sections stained in hæmatoxylin and eosin, as well as van Gieson's stain, did not reveal in any portion of the dilated appendix any evidence of the mucosa. This appeared to be mainly due to an atrophy of the mucosa, resulting from the pressure of the contents of the organ and to a much lesser extent to a destruction of the mucosa by a new growth, which in places could be seen invading both the submucosa and the musculature, but nowhere invading the deeper layers of the musculature or peritoneum, except in the vicinity of the perforation. The new growth presented the typical appearance of an adenocarcinoma, which, however, was evident only in the most recent portions of the growth, and was in no place at all abundant. The new growth was composed of glandular structures which were closely arranged, with but very little stroma. The glands were lined by a high columnar epithelium, the protoplasm of which stained well. In the most recent portions of the growth there was but little evidence of the gelatinous material; but as one traced the glandular structures into the older portions, the columnar epithelial cells became much elongated and the protoplasm stained faintly. The limiting membrane of certain of the cells appeared to have burst, and the contents were extruded into the lumen of the gland. The nuclei of the cells stained less deeply, and began to show slight evidences of fragmentation and disintegration. Gradually the cells became transformed into the gelatinous material, until in older portions of the tumor the indi-

vidual cells could no longer be distinguished and the nuclei, fragmented and disintegrated, were scattered in an irregular row along the few strands of stroma, while practically the entire gland spaces were occupied by the gelatinous material. Still older portions of the new growth, which to the naked eye appeared to be composed almost entirely of gelatinous material, presented somewhat of a lamellated appearance, the lamellæ being composed of the gelatinous material, while between the lamellæ vestiges of the stroma could be distinguished, associated with which were bits of the fragmented nuclei of the tumor cells. In the oldest portions of the tumor these lamellæ were closely packed together; the result, evidently, of pressure caused by the constant production of the material by the new growth. Between these lamellæ, which corresponded to the much altered gland spaces, the stroma could no longer be distinguished and the fragmented nuclei had entirely disappeared. In the place of the stroma and fragmented nuclei there was a small quantity of rather granular material, which stained deeply with eosin and was probably hyaline in character. The new growth appeared to be fairly well localized in the region of the perforation and did not involve the wall of the appendix at all extensively. Inasmuch, therefore, as there was no evidence of the neoplasm in other parts of the body, the conclusion would seem to be justified that this was a case of primary adenocarcinoma of the appendix belonging to the type which is usually known as colloid carcinoma.

CASE II, Fig. 4.—Mrs. L., aged thirty-six years, a patient of Dr. Macdonald. The patient had always enjoyed good health until about eight years previously, when she had an attack of what was called "peritonitis," from which she made a fairly good recovery, and had enjoyed good health until a short time before the operation, when she developed symptoms of pelvic disease. The patient had never manifested any evidence of disease of the appendix. At the operation a cyst of the right ovary was found associated with rather extensive pelvic inflammatory disease, for which bilateral salpingo-oöphorectomy was done. The appendix was free from adhesions and did not present any definite evidence of disease, but was removed in the course of the operation. The patient made an uneventful recovery, and has remained in perfect health ever since, the operation having been done in 1900.

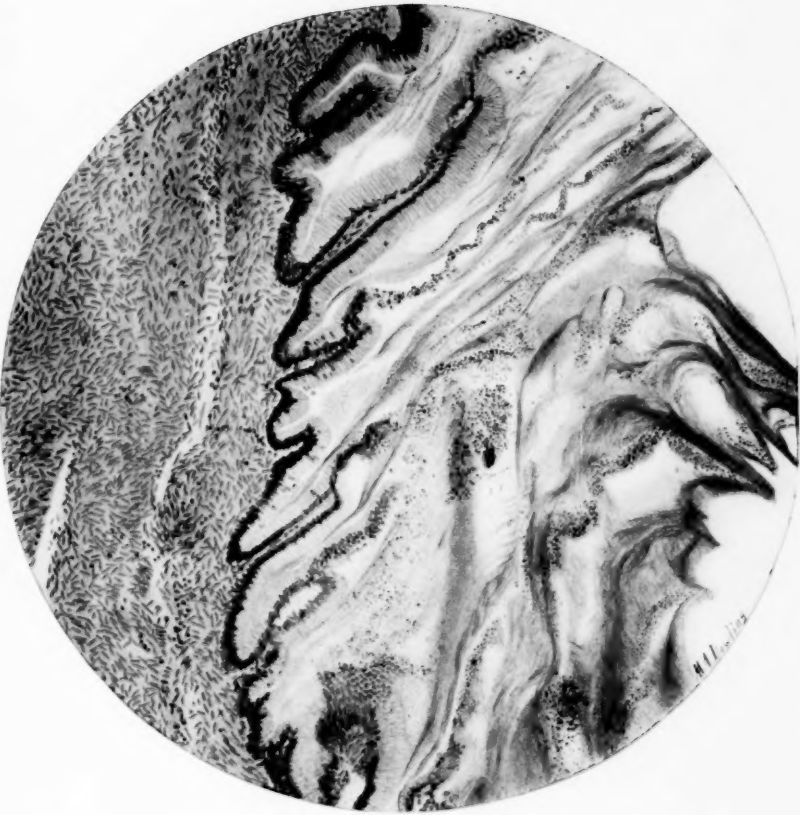


FIG. 3.—Case I., primary colloid carcinoma of appendix.



FIG. 4.—Case II., primary carcinoma of an obliterated appendix.

The appendix measured four centimetres in length and ranged from six to nine millimetres in diameter. The mesentery, which contained a considerable amount of fat, extended to the tip; the peritoneum was smooth and glistening; the vessels, however, were somewhat congested. Situated about one centimetre from the proximal end of the appendix was a slight enlargement which extended for about eight millimetres. It was in this region that the organ presented the greatest transverse diameter. The consistency of this portion resembled that of the rest of the appendix, which was decidedly firm. The lumen was completely obliterated throughout the entire organ. Transverse section of the base and tip of the appendix showed the lumen to be obliterated by a white reticulated tissue, in the meshes of which collections of fat could be seen. The muscular coat appeared to be normal.

Section through the enlargement already referred to showed the central portion of the organ to be occupied by a more homogeneous tissue, which in the specimen hardened in Orth's fluid presented a slight yellowish tinge. This tissue appeared to extend into the musculature, especially upon the side of the mesenteric attachment. Microscopical examination of sections through the proximal and distal portions of the appendix stained in hæmatoxylin and eosin showed the usual appearance of chronic obliterative appendicitis. The lumen could not be distinguished, and its place, as well as that of the mucosa, was occupied by rather loose connective tissue continuous with the submucosa. No vestiges of the mucosa, glandular structures, or lymphoid apparatus of the appendix could be distinguished. The muscular coats were somewhat thickened and hypertrophied, and the peritoneum was also slightly thickened. In sections through the enlargement of the appendix already mentioned the central portion of the organ was found to be rather densely infiltrated with a new growth, which involved to a lesser extent the musculature and peritoneum. The growth was characterized by numerous large and small alveoli occupied by cells, the outlines of which could be distinguished with difficulty, but which appeared to be for the most part cuboidal or polygonal in shape. These cells contained rather large round or oval nuclei, most of which stained well in the hæmatoxylin, but some of which were rather vesicular in character. The cells and nuclei appeared to be of fairly uniform size, and in most of

the alveoli were densely packed together. Some of the alveoli were so small as to present only three or four cells in transverse section. In many of the larger alveoli the process of fixing and hardening the tissue had caused the cells to shrink away *en masse* from the connective-tissue stroma, leaving a clear space. In certain of the alveoli a distinct lumen could be distinguished surrounded by one or two rows of cuboidal cells. Some of the larger alveoli contained a considerable number of red blood-corpuscles which may have found their way there either from trauma at the time of the operation or from invasion of the blood-vessels by the new growth, which in some places was quite evident. The protoplasm of the cells in some of the alveoli presented a small amount of rather diffuse yellowish-brown pigment. The outer or longitudinal layer of muscle appeared to be more extensively involved than the inner or circular layer, and both layers were most extensively involved on the side of the mesenteric attachment. The peritoneum, which was decidedly thickened, also presented numerous alveoli of tumor cells. The tumor was not circumscribed, but appeared to extend rather diffusely through the structures of the appendix, and appeared in places to extend along the blood and lymph channels. In general, the tumor appeared to be epithelial in character, although there were certain portions of it in which an endothelioma of blood-vascular origin was strongly suggested. It is our belief, however, from a careful study of many sections, that the tumor was a carcinoma of a somewhat alveolar type, and was undoubtedly primary in the appendix.

CASE III.—F. C., male, aged nineteen years, a patient of Dr. Macdonald, was admitted to the Albany Hospital, June 9, 1902, complaining of general abdominal pain. The family history was negative, as was the patient's past history. He had always been strong and healthy until the onset of the present illness.

The present illness began in January, 1902, with an attack of acute appendicitis, which was associated with the formation of an indurated mass in the right iliac fossa, in which after a short time an abscess formed, which opened externally in the right lower quadrant of the abdomen. The sinus still existed when the patient was admitted to the hospital. The tumor mass on the right side never disappeared, and the discharge from the sinus was fairly continuous. The patient had lost forty pounds in weight. There were no symptoms associated with the fistula

which suggested a communication with the bowel. No diarrhœa, but at times constipation. The patient had had more or less continuous pain in the right iliac fossa for several months prior to admission to the hospital. The fæces had never shown any abnormal appearance.

On admission the patient presented a well-marked tumor mass in the right iliac fossa, the size of a large fist. This mass was tender on palpation, and from the sinus there was a purulent discharge. A clinical diagnosis of tuberculosis of the head of the cæcum was made. The patient was operated upon June 11, 1902.

At operation the mass in the right iliac fossa was found to be composed of a new growth involving the appendix, cæcum, ileum, the ascending and a portion of the transverse colon, as well as a loop of the jejunum. All of the involved parts were adherent in a mass. It was found necessary to remove the entire cæcum with the remains of the appendix, and about eleven centimetres of the ileum and ascending, as well as of a portion of the transverse colon, and about eighteen centimetres of the jejunum. The appendix was almost entirely destroyed, and the lumen of the proximal portion opened freely into an abscess cavity the size of a small hen's egg, which contained and was lined by necrotic material, and which communicated with the fistula which opened upon the surface of the abdomen. The appendix and the tissues immediately surrounding it appeared to be the oldest portions of the new growth. There was also extensive involvement of the regional lymphatic glands, which were removed so far as possible. The severed ends of the jejunum were united by a Murphy button with secondary Lembert sutures. The end of the transverse colon was closed, while the end of the ileum was brought out into the wound. The patient did fairly well for about two weeks, when he began to grow weaker, and died of inanition.

The specimen removed at operation consisted of the cæcum, the remains of the appendix, about eleven centimetres of the ileum, the ascending and a portion of the transverse colon, and some enlarged lymphatic glands in one mass, while in a separate mass were about eighteen centimetres of the jejunum. The distal portion of the appendix was entirely destroyed, while the proximal two centimetres of the organ could still be distinguished. The lumen opened freely into a small cavity two and one-half

centimetres in diameter, situated between the ileum and the cæcum. This cavity was located in the mass of new growth, which appeared to correspond to the distal portion of the appendix, and which seemed to be the oldest portion of the tumor. The lumen of the appendix opened freely into the cæcum as well as into the small cavity already described. To this mass of new growth the lower portion of the ileum as well as the ascending and transverse colon were adherent, and were apparently extensively involved. The growth had caused an ulceration through the wall of the ileum as well as of the transverse colon, both of which perforations opened into the cavity already referred to. The new growth was very much more extensive in the peritoneal and muscular coats of the involved bowel than in the mucosa, and it seemed apparent that the adherent intestines had become involved secondarily. The new growth was of rather soft consistence, and on section of a grayish-white color, and appeared to be largely composed of a gelatinous translucent material resembling colloid. In portions of the tumor there was also marked necrosis and softening. The gelatinous material was contained in more or less definite spaces, separated by bands of connective tissue. The lymphatic glands were much enlarged and diffusely involved by the new growth, which presented extensive colloid degeneration.

Microscopical examination of sections through the base of the appendix stained in hæmatoxylin and eosin showed a decided thickening of all the coats of the organ, due to a diffuse infiltration by a new growth. The lumen contained a small amount of necrotic material. The lining epithelium had disappeared, but certain of the glands as well as some of the lymphoid tissue of the mucosa could still be distinguished. The new growth was for the most part of a somewhat glandular type and presented larger and smaller alveoli, which in the more recent portions of the growth were occupied by irregular shaped cells, most of which were cuboidal or polygonal in shape. In some of the alveoli a definite lumen could be distinguished, while in others none could be seen, and the entire alveolus was packed with epithelial cells. In some of the places there was a slight resemblance between the glands of the mucosa and the more recent portions of the growth. In certain portions the tumor was composed simply of narrow columns of epithelial cells, suggesting the appearance seen in carcinoma simplex. In older portions of the growth the alveoli

were much larger, and the epithelial cells were grouped along the periphery of the alveolus, while the central portion was occupied by a homogeneous substance which stained very faintly with hæmatoxylin, and which presented a marked reticulated appearance, and in which an occasional degenerated epithelial cell or nucleus could be seen. In still older portions of the growth several alveoli had apparently fused, and the intervening stroma as well as the fixed tissue in general had largely disappeared. Most of the epithelial cells had degenerated, and the alveoli were filled with colloid material, scattered through which were occasional more or less degenerated epithelial cells and free nuclei. The colloid material first appeared as small refractile globules in the protoplasm of the tumor cells. These globules enlarged and became fused, as a result of which practically the entire cell came to be occupied by the colloid material, which stained very faintly with hæmatoxylin. The nucleus of the cell either entirely disappeared or was pushed off to one side of the cell, presenting the signet-ring appearance. The cell membrane in many instances appeared to remain intact, but sooner or later ruptured, and the colloid material became fused with that resulting from the degeneration of neighboring cells. In the oldest portions of the tumor practically all the cells had undergone the colloid degeneration, and the alveoli were occupied simply by the colloid material without, in many instances, a single distinguishable epithelial cell or nucleus. These alveoli showed a marked tendency to fuse, thus giving rise to extensive areas of colloid material. The colloid substance presented a markedly reticulated appearance, part of which seemed to be due to the preservation of more or less of the cell membrane as well as some of the intervening stroma. There were, however, in the oldest portions of the tumor but comparatively little stroma and very few blood-vessels. The lymphatic glands were diffusely infiltrated with the new growth, and only a small zone of the lymphoid tissue remained immediately beneath the capsule. The colloid degeneration was even more marked in the lymphatic glands than in the tumor itself, and practically all of the new growth appeared to have undergone this degeneration.

From a careful, clinical, anatomical, as well as pathological investigation of this case, we feel justified in assuming that it was a primary colloid carcinoma of the appendix of an adenomatous type, with extensive secondary involvement of the neigh-

boring portions of the intestines, as well as the regional lymphatic glands.

The early view was that carcinoma of the appendix was not primary, but resulted from extension from some neighboring organ. On the contrary, recent investigation has shown that primary carcinoma of the appendix is of more frequent occurrence than is ordinarily supposed, while secondary tumors of the appendix are of rare occurrence, even though the cæcum may be extensively involved.

Regarding the etiology of carcinoma of the appendix comparatively little is known, although recent studies have shown that in some instances, at least, it is one of the sequelæ of chronic inflammation of that organ. Theoretically, the appendix should frequently be the site of carcinoma, because certain factors which are usually supposed to bear an important causal relationship to the development of neoplasms are in evidence in this organ. In the first place, carcinoma of the gastro-intestinal tract tends to originate at those portions which are narrow or constricted, which is one of the characteristics of the appendix. Secondly, foetal remains as well as atrophying organs appear to be more prone to the development of carcinoma, and such a condition is supplied by the appendix. Thirdly, mechanical irritation, which is such an important factor in the development of certain neoplasms, exists extremely frequently in the appendix, and usually results from the action of enteroliths, dried faecal matter, and occasionally foreign bodies. When one considers the great frequency with which gall-stones are followed by the development of carcinoma of the gall-bladder or bile passages, it seems extremely remarkable that such a condition is not more frequently observed in the appendix. Fourthly, chronic inflammation, which in so many instances is followed by the development of neoplasms, occurs almost as frequently in the appendix as in any organ of the body. The studies of Letulle and Weinberg, Harte and Willson, and others have shown that primary carcinoma of the appendix does occasionally develop in an organ the subject of chronic inflamma-

tion, usually of the obliterative type. Of such a character is Case II reported by the writer, in which a typical carcinoma had developed in a completely obliterated appendix. It may furthermore be urged that if more careful routine examination were made of appendices removed at operation, primary carcinoma would be observed more frequently, for in many of the cases reported during the past few years the new growth has been an accidental find, the presence of which was never suspected before operation, or even, in some instances, after macroscopical examination of the organ. It is only comparatively recently that many surgeons have made a practice of having all appendices removed at operation examined by a pathologist, and this certainly accounts for the increased number of neoplasms of this type observed of late. Sections should be studied not merely from one or two portions of the organ, but from several portions, and especially in those appendices which show evidences of chronic inflammation.

A striking feature of many of the cases of primary carcinoma of the appendix reported is the development of the disease in comparatively early life.

Of the twenty-three cases in which the proof seems conclusive that the new growth was primary in the appendix, the age of the patients is stated in seventeen. Nine of these seventeen, or 53 per cent. of the patients, were under thirty years of age, while four, or 24 per cent., were under twenty years of age. The youngest case reported was that of a child of twelve years. The early age at which such a large percentage of the cases occurred may be assumed to bear a definite relationship to the age at which appendicitis is most frequent. For, as is well known, the great majority of cases of appendicitis occur in individuals under thirty years of age, and an especially large percentage of the cases are under twenty.

Carcinoma of the appendix may belong to any of the ordinary types of that neoplasm, although the colloid type appears to occur more frequently than any other. In Cases I and II reported by the writer the neoplasms were of that variety. In a considerable number of the cases reported the new growth

was confined to the appendix, and did not present any evidence of either extension or metastasis. This was very likely due to the fact that most of the tumors were removed in a comparatively early stage. The tumor may attain considerable size and may ulcerate through the wall of the appendix, and thus give rise to a local or general peritonitis. It may also give rise to a focus of suppuration, which may present the usual characters of an appendicular abscess. By local extension neighboring portions of the intestines or other viscera may become involved, and the pathological picture will depend largely upon the extent of this involvement.

In the great majority of cases the diagnosis of carcinoma of the appendix is impossible. Writers have even gone so far as to state that it is practically *always* impossible. In some of the cases there are no symptoms whatever pointing to the appendix, and the tumor is an accidental find either at operation or autopsy, as instanced by Cases I and II reported by the writer. When symptoms are present, they are usually those of appendicitis of the chronic relapsing type. In some instances the new growth may apparently cause an acute attack of appendicitis, and a perforation may result, usually at the site of the tumor. Pain is perhaps the one symptom present in the majority of the cases. This is usually referred to the right iliac fossa and may be of very varied character. When present, it differs in no way from that associated with chronic appendicitis, and hence the diagnosis is usually of that condition. The pain is usually due to the mechanical action exercised by the tumor. In the later stages a well-defined tumor mass may present in the right iliac fossa which strongly resembles an appendicular abscess. When it attains considerable size, the tumor often shows a tendency to be associated with the formation of an abscess, which may open externally, and a discharging sinus is formed which shows no disposition to heal. From such a sinus gas and faecal contents may be discharged, though this is very exceptional. The existence of such a condition with normal defecation might speak in favor of a neoplasm of the appendix. Diarrhoea and constipation, or both, may also occur in the later

stages, but they are usually due to the extension of the tumor into the neighboring intestines, and are in no sense the result of the new growth in the appendix itself.

The treatment of the condition is exclusively operative, and since the association of the new growth with the inflammatory process in that organ has come to be so well recognized, there is an added reason for the extirpation of those appendices which present evidences of either acute or chronic inflammation.

From a careful study of the subject, the following conclusions may be drawn:

1. Primary carcinoma of the appendix is not of such rare occurrence as has been hitherto supposed.
2. Every appendix removed at operation or autopsy, if it presents any evidence whatever of disease, should be examined most carefully, and sections should be made from several portions of the organ for microscopical study.
3. The relationship of primary carcinoma of the appendix to chronic appendicitis, especially of the obliterative type, seems to be fairly definitely established.
4. Primary carcinoma of the appendix shows a tendency to develop at a comparatively early period of life.
5. Primary carcinoma of the appendix does not show a marked tendency either to extension or to metastasis.
6. The symptoms of primary carcinoma of the appendix are usually the symptoms of appendicitis of the chronic type.
7. The diagnosis of primary carcinoma of the appendix is in the great majority of cases impossible.
8. The treatment of the condition should always be operative.

[The writer wishes to acknowledge his indebtedness to Dr. W. W. Sanford and Miss M. A. Dowling for the drawings published in connection with this article.]

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THE SURGICAL TREATMENT OF ANURIA.¹

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I DESIRE to present the following history of a case of anuria recently operated upon, and to discuss the subject of the surgical treatment of anuria.

E. P. H., aged twenty-three years, unmarried, entered the Presbyterian Hospital, August 1, 1902. No urine had passed for six days, the last urination having been on Saturday, July 26. The family history reveals nothing. Patient's general health has always been good, with the following exception: After twelve years of age he had occasional attacks of pain in the left kidney region. During these attacks he was obliged to lie down, when the pain would gradually subside, always within twenty-four hours. Pain was dull and "aching," and not referred.

A diagnosis of stone in the left kidney was made five years ago by Dr. Loomis and others. It was some four years ago that he had his last attack of pain in the left side. For the past five years patient says he has been aware of a "fulness" in the left lumbar region, especially behind. One year ago he had pain in the right iliac region, which was diagnosed appendicitis by a physician in Des Moines.

Present.—This summer he began again to have pain in the right side, which continued intermittently, until one day, after working very hard in the harvest-field, complete suppression of urine occurred, six days before coming to the hospital. He describes this pain as being "deep in," and locates it in the region of right kidney; also a somewhat sharper pain in the iliac region of the same side, practically over the region of the appendix. When examined by his physician, six days before admission, a fluctuating tumor was discovered in the left kidney region. Before coming to hospital, Dr. Loomis, the attending physician, had sweated the patient freely.

¹ Read before the Chicago Surgical Society, January 5, 1903.

Examination on Admission.—No urine had passed for six days. A few attacks of vomiting before coming to hospital. Consciousness is retained. Patient is a young man; well developed; well nourished. Face slightly pale. Pupils equal on the two sides, and moderately dilated. Vision is normal. No disturbance of any of the special senses. Heart and lungs appear normal.

A fluctuating tumor is situated in the left lumbar region, extending from the last rib to the crest of the ilium. It appears to be retroperitoneal, since there is tympany upon percussion over the tumor anteriorly. Distinct tenderness upon pressure over course of right ureter. Distinct rigidity of abdominal muscles, especially on right side. Upon catheterization, no urine came from the bladder. Examination otherwise negative. The patient is able to walk about; does not give the appearance of being seriously ill, and has no symptoms of uræmia.

Operation, August 1, 1902. Three hours after admission a lumbar incision was made upon the left side, over the "cystic" tumor. A large hydronephrotic sac was found and opened, when three or four pints of fluid escaped. The wall of sac was thin, showing what appeared to be a mere remnant of kidney tissue. Fluid was clear or slightly turbid, containing albumen and only a trace of urea. A rubber tube was placed in kidney pelvis for drainage, the wound being closed except at position of tube. Temperature at midnight, 101° F.; pulse, 72.

8 A.M., August 2. Large amount of blood-stained watery discharge, saturating the dressings.

Repeated examinations of fluid from the left side showed only a trace of urea, from .2 to .3 per cent. No urine from bladder.

Twenty-four hours after the first operation an incision was made down upon the right kidney, which was found enlarged to about twice its normal size. An incision was made through its convex border into the pelvis of the kidney. Kidney tissue very thick in spite of the distention. Eight or ten ounces of urinous fluid escaped through the kidney wound. No stone could be felt. A tube was placed for drainage, as upon the opposite side, and covered with a large dry dressing.

Temperature was between 99° and 100° F. until 8 P.M., August 4, when it reached 102.8° F. Three days later it was again normal, and remained between 98° and 100° F., nearly

always normal, until the third operation, on October 11, 1902. Fluid from right side contained from 1.5 to 2 per cent. of urea.

Copious dry dressings were changed several times daily after operations on August 1 and 2, dressings being weighed before being applied, and immediately after removal, to learn approximately the amount of urine being secreted.

August 3. About twenty ounces in dressings over right side. Twenty to forty ounces was the average daily quantity in the weighed dressings until the third operation, October 11, 1902. No urine was voided from bladder until August 11, ten days after operation, and then only 45 cubic centimetres, as shown by the urinary chart. (See summary of urinary record.)

August 12. Methylene blue, three grains, given by mouth. Dressings over right side showed blue stain in forty minutes. No blue staining on left side.

On returning from my vacation early in October, I found the patient in most excellent health, although he was passing almost all his urine through the right lumbar wound. I decided to operate and find and remove, if possible, the cause of obstruction, which I believed existed in the right ureter.

Operation, October 11, 1902. Incision made at site of the former operation upon the right kidney on August 2. Fistulous tract in kidney was enlarged and finger passed through it into the pelvis. No stone could be felt. Kidney bound down by adhesions. What was thought to be a dilated pelvis or upper portion of ureter was found. Upon making a small opening into this, it proved to be duodenum, and was immediately closed. The ureter and pelvis were then identified and a small opening made into the beginning ureter, through which a metal bougie was passed into the bladder. Ureter very much contracted. No obstruction or stone found. Wound in kidney tissue was closed by catgut sutures as well as the opening into the ureter. External wound was closed at either end. Drained down to closed kidney wound with cigarette drain.

Considerable shock followed this last operation. Temperature remained normal until evening. At 3 A.M., sixteen hours after operation, he had a chill, with sudden rise of temperature to 105.6° F. Dressings were removed, and urine was found escaping through the wound. Eight hours later temperature was again normal. This seemed very much like an attack of urethral fever,

and was probably an ureteral fever due to catheterizing the ureter. Urine continued to escape through kidney wound, and frequent changes of dressings were made.

October 14. A drainage tube introduced into right wound; cigarette drain removed. Weighed dressings on October 14 showed approximately, right side, thirty-six ounces; left side, fifteen ounces.

Until October 24 the average daily quantity in dressings was as follows, right side, varying from thirty to fifty ounces; left side, varying from five to ten ounces.

Immediately after this the quantity in dressings was so markedly diminished that they were no longer weighed, and he continued to pass a large amount through the bladder.

On leaving hospital, November 10, the wound in right side is almost completely closed, the tube having been removed, and dressings are only slightly moistened. No pus. Small rubber tube allowed to remain in the left side; dressings over this are only slightly moistened.

Within a few days after leaving the hospital the wound on the right side closed completely. In spite of the three operations, the cause of obstruction still remains unknown. I believe that we can, however, state very positively that the case is one of obstructive and not reflex anuria, because of the fact that at the second operation a large quantity of urine was found pent up in the right kidney. As to the exact cause of obstruction, I can simply state that to my mind it was most probably a small stone, which either escaped through the wound or was passed per urethram. A careful examination of the bladder failed to discover any stone. A stone no larger than a grain of wheat could have obstructed the very small ureter. It is, of course, possible that the obstruction may have been due to uric acid crystals, masses of cystin, or blood-clots. The cause of the hydronephrosis on left side is also not clear. Several very fair X-ray views, with good differentiations, revealed no stone on either side. The patient later returned to the hospital and had the left hydronephrotic sac removed, and is now in excellent health.

The facts in regard to amounts of urine passed from the bladder and through the lumbar incisions can be approximately stated in the following way:

The operation of August 1 was done after a six-day period of complete anuria. The fluid escaping from the hydronephrotic sac from the morning of the 1st of August to the morning of the 2d contained but a trace of urea.

After the operation of August 2 until October 11, the approximate quantity in weighed dressing was from twenty to forty ounces, each twenty-four hours.

No urine passed by bladder until August 11, and then 45 cubic centimetres, containing much pus, and alkaline in reaction.

From August 11 to September 10, quantity passed from bladder varied from 26 cubic centimetres to 150 cubic centimetres daily.

From September 10 to October 11, the date of third operation, urine from bladder varied from 100 to 500 cubic centimetres daily, and contained considerable pus.

After operation of October 11, urine in dressing varied from thirty-four to sixty ounces until October 24, when this rapidly decreased, and practically ceased November 8. The day following the operation of October 11, 30 cubic centimetres were passed from the bladder; about same quantity until October 18, when 150 cubic centimetres passed. October 19, 1500 cubic centimetres by bladder. October 20, 2000 cubic centimetres from bladder, and 1000 cubic centimetres in dressings. November 8, practically no urine through wound, and 1680 cubic centimetres from bladder, and in reaction trace of albumen and very small amount of pus.

This case led me to a study of the subject of anuria, the results of which I submit in the following brief discussion.

Total suppression of urine occurs:

1. From mechanical obstruction of the ureter of the single functioning kidney of an individual, the other kidney either being congenitally absent or destroyed by previous disease.
2. From mechanical obstruction of one ureter in an individual possessing two functioning kidneys, with increased intrarenal pressure on the obstructed side, which by reflex nerve action prevents the unobstructed kidney from functioning, the so-called reflex anuria. Or, possibly, after a nephrectomy the involvement of the nerves in the pedicle may produce a reflex anuria.

3. From trauma of both kidneys, which, for a time or until fatal issue, is followed by complete cessation of function; also from trauma of a single kidney, which apparently by reflex action so affects the uninjured kidney that complete anuria results.

4. From acute nephritis, as sometimes seen in scarlet fever and other forms of septicæmia.

5. From destruction of practically all kidney tissue as the result of such chronic lesions as tuberculosis, cystic degeneration, etc.

6. From certain poisons, as phosphorus, lead and turpentine, ether, chloroform, etc.

7. From the peculiar condition known as urethral fever, commonly the result of the passage of a catheter or sound.

8. In the polymorphous symptom-complex, known as hysteria, anuria may occur.

Anuria is a condition. It is not a disease *per se*. Until within the last twenty years, indeed, one might almost say until the last ten years, the condition has been discussed merely as a symptom occurring in a number of diseases, which usually marked a fatal termination, and for which little could be done by the medical attendant. Within the last twenty years, however, so much light has been thrown on the subject by Tuffier, Morris, Israel, and others, and so much good has been accomplished by intelligent surgical interference, that to-day the condition of anuria is entitled to be placed, I believe, in the same class as the condition ileus, as one of sufficient importance to be considered and handled as a surgical entity.

Such a consideration of the subject is of special value from a clinical stand-point, because in the majority of cases, or at least in those cases in which interference holds out any prospect of relief, the anuria is the important overshadowing condition with which we have to deal. It is *the* condition which menaces the life of the patient. It is *the* condition which is evident, even though the exact cause of the obstruction may not be clear; and it is *the* condition which must be relieved in order to save the life of the patient.

We are all familiar with the great good that has resulted from the modern method of considering ileus as a surgical entity. The carrying of this method to the bedside, and attempting not a refined diagnosis of the pathological anatomy present, but a diagnosis as to whether we have paralytic ileus, a strangulation ileus, or an obturation ileus to deal with, and choosing our method of treatment accordingly.

It shall be my effort in the present essay to discuss the subject of anuria in somewhat the same way as we do ileus, and attempt to present a working classification which shall be useful at the bedside as a means of determining our line of interference or action.

Henry Morris, in the Hunterian Lectures of 1898, devotes a lecture to the subject of "Calculous Anuria," and gives briefly a historical review of the subject, from which lecture I have obtained the following references to early work on this subject.

Sir William Roberts called special attention to this condition in his work on "Urinary and Renal Diseases," published in 1872.

Pierre Merklen, in 1881, published in Paris an exhaustive treatise on anuria.

Guermonprez reported the first case, operated on in 1870.

Bardenheuer reported the second case, operated on in 1882. Morris operated the third case, in 1884.

Cases then followed, a few each year, until, in 1898, Morris could collect forty-nine cases operated on, and also forty-eight cases reported, but not operated on.

That the subject has not received the attention it deserves is shown, first, by the fact that most modern text-books on surgery either omit it altogether, or dismiss it with a brief and unsatisfactory statement; and, second, by the fact that few practitioners are familiar with the condition, its various causes, and the appropriate means of relief. I confess that my own knowledge of the condition was very limited and vague until the case which I have just reported forced me to a careful study of the subject. To be sure, the condition—anuria—is not one

very commonly met. I understand that the majority of our members have not operated on cases suffering from total suppression of urine. Still, the general recognition of the condition and methods of treatment are, nevertheless, extremely important, because statistics clearly show such a wide difference in results in cases properly and those ignorantly handled. Seventy-five per cent. of early operated cases recover, and but 25 per cent. of the unoperated survive the attack.

The best articles on the subject which I have been able to obtain are those of Henry Morris, in his monograph of 1902, on "Surgical Diseases of the Kidney," and by J. Israel, in his *Chirurgische Klinik der Nierenkrankheiten*, Berlin, 1901. Many of the articles on anuria have been limited to the discussion of calculous anuria, and give one rather a narrow view of the subject. I am inclined to believe that this is a mistake, and that, as an aid to differential diagnosis, the discussion of anuria should be broadened to cover total suppression of urine from all causes.

The clinical classification which I would suggest is the following:

ANURIA.	I. OBSTRUCTIVE.	(a) Obstruction to ureter of single functioning kidney. This is the most common form.
		(b) Obstruction of both ureters practically simultaneously. This is very rare from stone; more common from extramural pressure, as carcinoma of uterus.
	2. REFLEX OR PARALYTIC.	(a) Obstruction of one ureter, increased intrarenal pressure of this side, which, by reflex action, suppresses function on the other side.
		(b) Removal of one kidney and, by reflex action, from injury to nerves in pedicle; suppression on the other side.
		(c) In this group can fairly be included the rare cases of hysterical anuria.
		(d) Traumas of kidney or kidneys.

ANURIA.	3. NON-OBSTRUCTIVE OR NEPHRITIC.	<ul style="list-style-type: none"> (a) From nephritis, as after scarlet fever. (b) Anæsthetics; ether, chloroform, etc. (c) Poisons, as phosphorus, turpentine, etc. (d) Poisoning by toxins in various general diseases, as cholera. (e) Urethral fever, which, as an acute septicæmia, may produce suppression, or possibly, by reflex nerve action, produce same result. (f) Lesions gradually destroying first one and then both kidneys, as tuberculosis, cystic degeneration, etc.
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A clear differentiation should be kept in mind between anuria and uræmia. Anuria is a suppression of urine; merely a condition, not a disease. Uræmia is a disease, a toxæmia, developing from a nephritis, or in the course of an attack of anuria.

That uræmia is not due simply to the suppression of urine is clearly shown by a study of the cases of obstructive anuria where patients continue in fair condition for a week, or even two weeks, without a symptom of uræmia developing. Patients with total suppression have lived twenty-five days after the onset of the attack, whereas, as is well known, uræmic patients seldom live more than three days after the beginning of an attack, with total suppression.

Uræmia is usually the cause of death in anuria, but may not develop at all in the cases which recover either spontaneously or are relieved early by surgical interference.

In the first two groups of our classification, *i.e.*, obstructive and reflex anuria, uræmia is not an essential part of the picture. In the third group, non-obstructive or nephritic cases, uræmia is an almost constant accompaniment.

Let us consider these three groups in the order named, and study the pathology, symptoms, course, termination, and treatment.

1. *Obstructive Anuria*.—Here the pathological anatomy reveals at operation or post-mortem, in the great majority of cases, a single functioning kidney, the other kidney congenitally absent, or removed by previous operation, or destroyed by previous disease. The ureter of the single functioning kidney is obstructed by stone, blood-clot, pus, masses of crystal of uric acid, cystin, etc., by kink in ureter, by valve-like action of ureter, with oblique insertion into pelvis, by extramural pressure, as from carcinoma or fibroma of uterus or abscess in pelvis or abdomen.

The simultaneous obstruction of both ureters with resulting anuria is rare.

The symptoms are usually pain of the character of a renal colic, on the side last obstructed, followed by anuria accompanied by tenderness over region of kidney and ureter, and muscular rigidity on that side, sweating, seldom of uriferous order. In a number of cases, but by no means constant, physical examination determines the presence of an enlarged kidney on the affected side. This is often difficult to determine before anæsthetic because of the muscular rigidity. The general condition of the patient is often surprisingly good; no temperature, no increase of pulse-rate, and, as in my case, the patients often walk about and eat and drink and present to all outward appearance almost a normal condition for a number of days after the onset of the attack. Usually by the seventh or eighth day uræmia symptoms appear, although, as noted, these may be postponed for two weeks or more, and then the patient, if not relieved rapidly, succumbs to the toxæmia. In many cases where the opposite kidney has been destroyed by previous disease, a history of symptoms pointing to this fact can be elicited, or, as in my case, where this previous disease has resulted in a hydronephrosis, this fact may be elicited by the physical examination. Sometimes, however, the onset of the attack is not marked by any acute symptoms, but comes on insidiously, and again may come on very acutely, but without any previous history to aid in the diagnosis.

The most common picture in calculous anuria is quite clear.

A history of repeated renal colic on one side, which results in destruction of that kidney as a functioning organ, and then later renal colic on the other side, with resulting anuria. In other cases, as the McArthur case, reported at our last meeting, the kidney first involved was removed by operation, or, as in the Polk case, a nephrectomy is made on the single kidney possessed by the individual. Polk's case lived eleven days after operation. I have myself performed nephrotomy on a tuberculous pyonephrosis, where the other kidney, as shown post-mortem, had been entirely destroyed by tuberculous disease, and had the patient live twenty-odd days without passing a drop of urine from the bladder. During this period a small amount passed daily, from five to twenty ounces, through the nephrotomy wound.

Senn, in his monograph on "Tuberculosis of the Genito-Urinary Organs," reports a case of intermittent hydronephrosis with anuria during the attack, and gradual enlargement of the left kidney from the retained urine. Senn operated when the patient had had anuria for three days and was becoming uræmic. At the operation, done under infiltration anæsthesia of cocaine, a very greatly dilated and hypertrophied kidney was found and opened with the cautery knife. About two quarts of urine escaped, the kidney tissue was very thick in spite of the dilatation, a stone plugging the ureter was removed, and the patient went on to a recovery. Senn interprets the evidence as pointing to an absence of the other kidney.

The indications for treatment in obstructive anuria are clear, distinct, and imperative, *i.e.*, a nephrotomy on the kidney last attacked, not later than forty-eight hours after the onset of the symptoms. The pain, tenderness, and muscular rigidity usually point clearly to the side to be operated on.

Such nephrotomy meets the vital indications. It furnishes an outlet for the urine; it enables us to remove the cause of obstruction, if in the kidney or pelvis, and by division of the kidney tissue and bleeding relieves the congestion, which, although a result of the obstruction, is a condition which, if it continues, of itself prevents the secretion of urine. Such a

nephrotomy can be rapidly done, probably safest under nitrous-oxide anaesthesia. Prolonged operations, such as removal of stone from ureter, or plastic work on the ureter, should not for a moment be considered at the first operation, but should be postponed until the patient has been relieved of the anuria and brought into fairly normal condition, when it can be more intelligently and safely performed.

Israel quotes statistics giving 66 per cent. of recoveries after operation, and but 28.5 per cent. without.

Morris gives 51 per cent. of recoveries from operation and 20.8 without.

It is to be remembered, however, that many of these operated cases were allowed to go unrelieved for a week or more; and it is quite certain that, if the cases were operated on by the end of forty-eight hours, the recoveries would exceed 75 per cent.

A nephrotomy is to be regarded as the operation of choice, instead of an ureterotomy or incision into the pelvis, because it is easier of performance, can be more rapidly done, gives a freer access to kidney and pelvis, and relieves the congestion.

If, at the time of the nephrotomy, the surgeon finds that he has operated on the wrong side, as has occasionally happened, he should at once operate on the other side, unless, as in my case, there is fair ground for believing that we have a reflex anuria to deal with, and that relieving the pressure in an old non-functionating kidney may relieve the reflex anuria. If, by the next day, however, this hope has not been realized, a nephrotomy should be made on the opposite side.

2. *Reflex Anuria.* — The existence of reflex anuria has been denied by a number of observers. Personally, I have been very sceptical on this point, and doubted the existence of this condition. I am quite positive that many of the reported cases of reflex anuria have been pure types of obstructed anuria, and the cause of the obstruction not found at the operation, or even post-mortem. On the other hand, a careful review of the reported cases, and especially the experimental work of Dr. Arthur Götzl, one of Israel's students, has convinced me of

the existence of such a condition. Götzl showed by experiments on dogs that, by increasing the intrarenal pressure in one kidney, he could lessen and even completely suspend the secretion from the other.

These experiments mimic the conditions sometimes clinically found, and it is quite possible that, as I thought in my own case, we may have a reflex anuria to deal with, *i.e.*, that the great intrarenal pressure in a hydronephrotic kidney on one side might, by reflex action, prevent secretion on the other, and that after relieving the pressure in the hydronephrotic kidney the function of the other side might return.

In my case it is now quite evident that this was not so, as we found from eight to ten ounces of urine on the functioning side. I now accept the possibility of the condition, reflex anuria, and believe that such possibility should always be considered in the handling of a case. I am convinced, however, that it is of rare occurrence.

This question is of great importance in determining the treatment of a case, *i.e.*, in deciding upon which side we shall make our nephrotomy.

Theoretically, in operating on a case of reflex anuria, we should leave the sound kidney alone, and operate on the side which is diseased, and which by reflex action has inhibited the secretion of the other, the sound, organ; and in some cases this plan has been successful in relieving the anuria, as shown by a number of cases where a hydronephrotic kidney causing reflex anuria has been incised or tapped, relieving intrarenal pressure, and this followed by resumption of function by the other kidney.

Practically, the question presents a difficult problem, because the diagnosis of reflex anuria is never to be made at the time of operation with any degree of certainty. In those cases where the pain, tenderness, and muscular rigidity are confined to one side, and on operating on this side a non-functioning kidney is found, and intrarenal tension relieved, we may hope that we have a reflex anuria to deal with, and that this procedure may restore the function on the opposite side.

However, if within twenty-four hours our hopes are not realized, a nephrotomy should be made on the other kidney.

In the anuria from trauma we have a composite and complicated picture. Here both kidneys may be injured and cessation of function result, either from nerve injury or injury to blood-vessels, or rupture of both kidneys and extravasation of urine into the perirenal spaces or into peritoneum. Or we may have but one kidney injured and anuria result from reflex suppression of the other side.

The line of action to pursue must be controlled by the major symptoms present.

A case where anuria is but one of the results of surgical shock, without gross injury to the kidneys, is to be handled by salt solution, per rectum or subcutaneously. A case where anuria is the direct result of gross injury to kidney or kidneys should be operated on, kidney drained, and hæmorrhage controlled. Probably this had best be done under nitrous-oxide anæsthesia.

The reflex anuria following operations on the kidneys, as nephrectomy, is again a complicated picture, where surgical shock, hæmorrhage, the toxic effect of the anæsthetic, and reflex action on the other kidney from irritation of nerves of the operated kidney are so blended that it is difficult to assign to each its proper place. Tilden Brown, in the report of such a case, in Vol. xxxiii of *ANNALS OF SURGERY*, assigns an important place to the anæsthetic and possible pressure on the sound side during the prolonged anæsthesia; also that the very weak heart's action and consequent low intra-arterial pressure was largely accountable for the failure of secretion. He advocates nitrous oxide and ether or nitrous oxide and oxygen as anæsthetic of choice in similar cases to prevent anuria. Personally, I should agree with him, but in all short anæsthesia (for the relief of anuria itself), ten minutes or under, I would strongly advocate nitrous oxide and air. I have never had the opportunity of using it in a nephrotomy for anuria, but have used it in other somewhat similar cases, as in enterostomy for ileus and appendiceal abscess, etc., and am quite satisfied that

the imperative nephrotomy for anuria could be easily done in the ten-minute anæsthesia of nitrous oxide and air, with greater safety to the patient than by any other method. In the absence of nitrous oxide, one might use infiltration anæsthesia of cocaine, as in Senn's case. I have once performed a nephrolithotomy by this method, and removed four stones from the kidney substance and pelvis. The aim should be to prevent post-operative and postanæsthetic anuria by proper choice of anæsthetic, rapid operating, and limiting surgical shock. Little can be done to correct the condition after it is established, except the usual means of combating shock, especially the use of normal salt injections. It is possible that pure reflex anuria results sometimes from the passage of a sound; usually, however, such anuria is septic, and due to an acute septicæmia. We shall consider this, therefore, as belonging under the head of non-obstructive or nephritic anuria.

Hysterical anuria may, I think, be placed in this group of reflex or paralytic anuria. This condition is not infrequently reported, but these cases are undoubtedly, as a rule, cases of deception. Such proved to be the fact in a case observed by Dr. Frank Andrews and Dr. Billings. There are, without much doubt, cases of true hysterical anuria. They are certainly, however, extremely rare, and are usually so closely associated with other evidences of hysteria as to make the diagnosis not difficult. Such a diagnosis would, of course, eliminate any surgical interference from consideration.

3. *Non-Obstructive or Nephritic Anuria.*—Non-obstructive or nephritic anuria has been generally regarded as strictly a medical condition, one which occurred in the course of profound and fatal uræmias, and for which surgery held out no hope.

Within the last few years, however, since operative treatment has been suggested and tried in both acute and chronic nephritis (*i.e.*, splitting the fibrous capsule and stripping the fibrous capsule from the kidney) and nephrotomy, a number of cases of nephritic or non-obstructive anuria had been submitted to operation.

The reasoning on which such treatment is based is the following: The congestion of the kidney present in these cases, although a result and not the cause of the cessation of function, is, nevertheless, a factor in preventing secretion; and if by a surgical operation, as nephrotomy, this congestion could be relieved, secretion might be resumed, and the patient go on to recovery. The position seems logical, and a number of clinical results seem to support it. Such treatment is, however, to be regarded as, as yet, distinctly experimental, and not to be indiscriminately advocated and employed.

Israel, with his wide experience with kidney surgery, does not hesitate to advocate nephrotomy early on one side in case of anuria from scarlet-fever nephritis.

I am quite willing to accept Israel's position with, of course, some reservations.

1. Non-obstructive anuria should, in most cases, be handled medically, best by sweats and normal salt solution injections.

2. When the non-obstructive anuria is simply an incident in a profound toxæmia, no surgical procedure seems warranted.

3. When a non-obstructive anuria is the major factor in a case which has not responded favorably to medical treatment, nephrotomy should be tried under nitrous oxide anæsthesia, and this should not be delayed too long, because the continued intense congestion may permanently disable the kidney epithelium.

The conclusions from this short study are:

1. The clinical importance of recognizing the three forms of anuria—obstructive, reflex, and non-obstructive—is to be emphasized.

2. The imperative necessity of surgical interference in the obstructive and reflex forms, and its possible value in the non-obstructive cases.

3. That in the first two varieties, at least, a rapid nephrotomy on the side of pain, tenderness, and muscular rigidity is the operation of choice. If necessary, do not hesitate to make a double nephrotomy.

4. That nitrous-oxide anæsthesia is probably to be preferred.
5. That time-consuming operations to relieve permanently the obstruction are to be postponed to a later period, after the patient has recovered from the anuria.
6. Operate early by the beginning of the third day.

RESULTS OF DECAPSULATION OF THE KIDNEY.¹

A STUDY OF CHANGES NOTED IN THE RENAL AND PERIRENAL TISSUES OF DOGS AFTER DECAPSULATION.

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THE following research was undertaken by the writer at the request of Dr. W. T. Howard, of Western Reserve University. Its purpose was to study the changes in the renal and perirenal tissues of the dog following decapsulation of the kidney. The work was done in the Anatomical and Physiological Laboratories of the University of California. Fifteen dogs, varying in weight from twelve to thirty-five kilogrammes, mostly of the mongrel type, and having kidneys varying in weight from 30 to 100 grammes, were used. Changes were studied after two, four, and eight days; two, three, and four weeks; two, and three and a half months.

The kidney of the dog is covered over three-fourths of its surface by peritoneum, the mesentery of its intestine being free throughout its entire extent, while the intestine itself shows no sharp division between the large and the small, such as exists in man. Consequently, the peritoneal cavity must be opened in any operation involving decapsulation. The peritoneum is very closely adherent to the anterior and the exterior surfaces of the kidney, and is separated from it with difficulty. There is quite an extensive circulatory anastomosis between it and the kidney by means of several small vessels which, penetrating the capsule, enter or leave the cortex. In those cases in which the kidney was injected with Prussian blue, the fluid could be seen issuing rapidly through these vessels, bringing

¹ Read before the California Academy of Medicine.

out beautifully the capillary net-work in the peritoneum covering the renal tissue.

OPERATIVE TECHNIQUE.

Preliminary injection of morphine is followed by ether anæsthesia. The dog is placed on its side. An area extending from the last rib to the crest of the ileum (approximately fifteen centimetres wide) and having the edge of the erector spinæ muscles as a guide to its central portion, is shaved, then scrubbed with soap and water, followed by alcohol and bichloride 1 to 1000. The incision is made along the external edge of the erector spinæ group. The fascia is split in the direction of the fibres and separated anteriorly from the muscle by blunt dissection until a point behind the kidney is reached, when the fascia is again opened, the peritoneum ruptured along the external renal border, and the kidney itself drawn through the wound and completely exposed. The capsule is then split from pole to pole, reflected as far as the pelvis, and cut away with scissors. The kidney is returned to place and the wound then closed by layers with interrupted chromicized catgut sutures. The skin is brought together by a continuous over-and-over catgut suture. A dressing of sterile gauze is applied and the whole protected by a plaster-of-Paris jacket. After-treatment was water and bread for twenty-four hours, and after that full diet was given.

Fifteen dogs were operated upon, of which five died. The following is a list of the fatal cases:

Dog 3. White bull terrier, eighteen kilos. Decapsulation of both kidneys and ligation of left renal artery. Death thirty-six hours.

Dog 5. White terrier bitch, ten kilos. Decapsulation of both kidneys. Death from shock three hours.

Dog 7. Mastiff pup, thirty-five kilos. Decapsulation of right kidney. Death three days, hernia through wound (plaster having been removed on account of irritation).

Dog 8. Brown mongrel bitch, eighteen kilos. Decapsulation of right kidney. Scoring of left kidney. Death three days, hernia through wound (plaster also having been removed for the same reason).

Dog 12. Brown spaniel bitch, seventeen kilos. Decapsulation of left kidney. Capsule very adherent and removed with difficulty, fragments of the cortex adhering to it. Death same day.

A study of the urine was not made, as abundant opportunity has been offered to examine this in man after Edebohls' operation for movable kidney, when it frequently shows the presence of blood and hyaline casts.

The dogs that recovered did well after operation, showing little sign of shock. Deaths were due in two cases, 7 and 8, to hernia through the wound, caused by premature removal of the plaster. On dog 3, in addition to decapsulation of both kidneys, the left renal artery was ligated. Dog 12 probably died from leakage of urine from the lacerated kidney into the peritoneal cavity. Dog 5 was the only one on which simple decapsulation was performed that died directly from the shock of operation. The deaths from hernia were due to careless application of the plaster bandages and could easily have been avoided.

The following is a brief *résumé* of the successful experiments:

Dog 14. Newfoundland bitch, thirty-five kilos. Decapsulation of right kidney. Killed in two days.

The decapsulated kidney was found adherent posteriorly, and at its upper pole to the liver; adhesions not extraordinarily vascular.

The free surface was dark red and covered with a very thin, smooth, adherent exudate.

Microscopical Examination.—For purposes of comparison, I will describe the appearance of the capsule of the normal kidney, which applies to all of the normal kidneys examined.

Hæmatoxylin and Congo red. Capsule consists of two layers, the inner, narrow (twenty-seven micromillimetres), its fibres running in straight lines and comparatively rich in nuclei, which are oval, shorter and thicker than those in the outer layer, which is eighty-two micromillimetres in thickness, wavy, and having a few elongated, narrow nuclei.

Mallory's connective-tissue stain gives additional information.

The capsule is colored a brilliant blue, and a distinction between its two layers is brought out very clearly. The outer is seen to consist of from eight to ten thicknesses of long wavy strands of connective tissue, while the inner takes a lighter stain, showing numerous irregular, ill-defined tendrils having a general longitudinal direction, and directly continuous with the intertubular framework. The outer layer is about three times as thick as the inner.

Microscopical examination of decapsulated kidney. Hæmatoxylin and Congo red. Serofibrinous exudate on surface varying in thickness from

45 to 275 micromillimetres, containing numerous red blood-corpuscles with a few lymphocytes and polymorphonuclear neutrophiles.

The inner layer of the capsule persists, but the line of demarcation, between the exudate and it, is not clear. Mallory's stain shows clearly the inner layer of the capsule intact with the exudate resting upon it.

Microscopical examination of cortex. Running inward from the periphery are pyramidal areas (bases outward) of an infiltration consisting of small round cells together with proliferation of new connective-tissue cells. The lines of the infiltration are for the most part along the medullary rays. In places the structure of the tubules is obliterated, while in others they are much distorted. The glomeruli are not involved in the process.

Dog 13. Mongrel poodle, ten kilos. Decapsulation right kidney. Killed on fourth day. The exudate can be picked up on the thumb-nail. It comes away from the kidney readily, but is very friable and tears off in small bits. The adhesions, as have been noted in all the specimens, are principally posterior, and bind the kidney firmly in place to the posterior wall.

Microscopical examination reveals a serofibrinous exudate from 55 to 220 micromillimetres in thickness, containing principally red blood-corpuscles with a few lymphocytes and polymorphonuclear neutrophiles. Mallory's stain shows an increase in the connective tissue of the inner layer of the capsule. Infiltration of the cortical substance of the kidney as noted in Case 14 is lacking.

Dog 15. White terrier dog, fifteen kilos. Decapsulation right kidney. Killed on eighth day.

For the first time a membrane having the characteristics of a capsule is noted. It is well marked, strips readily, and is of a fairly firm consistency. Its color is reddish brown. It varies in thickness, and still more closely resembles an exudate than a capsule.

Microscopical examination. Inner layer of capsule varies in thickness from seventeen to twenty-seven micromillimetres, on which is superimposed an exudate of from five to ten micromillimetres in thickness.

Hæmatoxylin and Congo red show thin continuous layer of newly formed connective-tissue fibres running in straight lines, richer in nuclei than the capsule of the normal kidney, and containing here and there small collections of unabsorbed red blood-corpuscles; no infiltration of kidney substance with cells; no increase in the interstitial tissue.

Mallory's stain shows thin blue line of newly formed capsule. No change is noted in the cortex of the kidney.

Dog 10. Brown mongrel bitch, fifteen kilos. Decapsulation of right kidney. Killed on thirteenth day.

The new capsule is thicker than that of the normal kidney, varying from 137 to 220 micromillimetres. It is not so firm, tears more easily, and is more closely adherent to the surface of the kidney.

Microscopical examination. Thick homogeneous layer of connective tissue, the fibres of which are widely separated. As noted in Case 14 (two days' duration), there is some infiltration in the intertubular tissue of the cortex, with small round cells accompanied by a proliferation of new

connective-tissue cells. The process is not nearly so extensive as in the former case. The glomeruli are not affected.

Dog 12. Black mongrel bitch, fourteen kilos. Decapsulation left kidney. Dog killed on twenty-first day.

The new capsule resembles normal capsule. It is of about the same thickness, but not so firm. Both kidneys have the same color, but the decapsulated one lacks the glazed surface of the other, which is covered with peritoneum.

Microscopical examination. Thin organized fibrous investment of kidney twenty-two to fifty-five micromillimetres in thickness. No change is noted in the cortex of the kidney. One specimen shows the capsule formed and persisting under fatty adhesions.

Dog 1. White and black terrier bitch, twelve kilos. Decapsulation both kidneys. Killed on the twenty-ninth day. Both kidneys injected with Prussian blue through the aorta.

Microscopical examination of kidney, adhesions, and liver. Kidney injected with Prussian blue. Adhesions to liver not vascular; capsule thick and well marked, but with fibres not so compactly placed as those in the normal capsule; light adhesions connected with the liver. The glomeruli and blood-vessels are all extensively injected with the blue. Scattered freely throughout the cortex of the kidney, and having no definite relation to either the pyramidal or labyrinthian tubules, are collections of small round cells, together with a few polymorphonuclear neutrophiles. A similar area is observed in the liver not far removed from its adhesion to the kidney. One patch in the kidney shows a preponderance of polymorphonuclears over small round cells.

Kidney and fat adhesion. The capsule here is not so well defined from the adhesions as in the previous specimen, otherwise they are similar.

The interesting point in these specimens is the fact that the capsule can be seen clearly defined from the adhesions binding it to the liver and other structures. The very slight injection of the adhesions with Prussian blue demonstrates the absence of any important circulatory anastomosis between the kidney and other tissues.

Dog 2. White and black mongrel dog, thirteen kilos. Decapsulation both kidneys. Dog killed on the fifty-second day, and both kidneys injected with Prussian blue through the aorta.

Capsule well formed, strips readily, not so tough as normal capsule.

Microscopical examination. Capsule 82 to 100 micromillimetres in thickness. Mallory's stain shows thick, well-developed capsule, though in a single layer, as has been noted in all new capsules.

Dog 4. White and black terrier bitch, nine kilos. Decapsulation left kidney, with ligation of right renal artery.

The object of this experiment was to see if an added amount of work thrown on the left kidney would add to the vascularity of its adhesions. This did not occur. The dog was killed on the one hundred and fifth day. The right kidney was shrunken to the size of a large chestnut, and was completely disorganized.

Left kidney. Capsule closely adherent and very firm.

Microscopical examination. Thick, irregular capsule 110 to 275 micromillimetres, and having a structure similar to that of Case 2. No changes noted in the cortex of the kidney.

Dog 6. Greyhound bitch, twenty kilos. Nephrectomy right side.

After thirty-seven days the dog was etherized and its abdomen opened. The remaining kidney was found much enlarged, with corresponding increase in size of renal artery and vein. No increase was noted in the amount of circulation taking place between the peritoneum and kidney. The kidney was then decapsulated. No increase in amount of bleeding over decapsulation of kidneys that have not had extra demands laid upon their functions. The kidney was then injected with Prussian blue and the dog killed.

Microscopical examination shows that the thin inner layer of the capsule has not been removed in the process of decapsulation.

Dog 9. Brown mongrel dog, eighteen kilos.

The purpose of this experiment was to study the normal circulatory relations between the kidney and the peritoneum.

Abdominal section. Kidneys injected with Prussian blue through aorta. At various points the blue fluid could be seen issuing from the cortex of the kidney in such amount as to inject thoroughly the peritoneum over it. Peritoneum was found to be adherent to the capsule. When both were removed from the kidney, eight to ten small vessels under the high pressure emitted the injection fluid rapidly.

SUMMARY OF FINDINGS.

First. The capsule of the normal kidney consists of two distinct layers, the outer being much the thicker, while the inner is very thin, the direct continuation of the intertubular connective tissue.

Second. In the operation of decapsulation the outer layer only is removed, leaving the inner lacerated but adherent to the kidney's surface.

Third. At first a thin exudate appears on the free surface of the kidney, which, with the remains of the inner layer, gradually becomes a fibrous investment, resembling macroscopically the normal capsule in that it strips readily, and with the passage of time it becomes more and more firm.

Fourth. Microscopical examination reveals the fact that it is in some cases thicker and in others thinner than the original, the former generally being true, and that in most instances it varies greatly in thickness in the same specimen. Vide Case 4, where it runs all the way from 110 to 275 micromillimetres.

Albarran and Bernard, in experimenting on rabbits, observed the formation of the new capsule up to six months, and found it always thicker than the original after two months. (*Société de Biologie*, 21 Juin, 1902.)

Fifth. The structure, at least up to three and a half months, does not become differentiated into layers, but is one homogeneous mass of fibrous tissue.

Sixth. Case 1 reveals the fact that it will form under adhesions, and is to be recognized as distinct from them both microscopically and macroscopically.

Seventh. There is sometimes an infiltration with round cells and a proliferation of the intertubular connective tissue of the cortex, without, however, affecting the glomeruli. The dogs in whom these changes were noted remained perfectly well as far as could be shown by their appetite, strength, and playfulness.

Eighth, and most important, is the fact that in no case was there any considerable anastomosis between the renal and perirenal blood channels. In Case 4, at the same time decapsulation of one kidney was performed, the renal artery of the other was ligated. This would presumably call for increased activity in the circulation of the decapsulated kidney. It was all, however, made up by the increased size of the renal artery and vein, and not through a peripheral anastomosis.

CONCLUSIONS.

There are many difficulties in the way of drawing inferences as to the value of this measure as a curative or a palliative one in chronic glomerulonephritis. The chief one is that it has up to the present time been found impossible to give a dog an interstitial glomerulonephritis. I quote from Herter, *Philadelphia Medical Journal*, 1898: "I have made repeated efforts with different metallic poisons to experimentally induce glomerular and interstitial lesions in rabbits and dogs, but have regularly failed." He was able to produce merely the lesions of acute degenerative nephritis and congestion. Morse found that toxins of the staphylococcus pyogenes aureus were capable of

initiating those proliferative changes in the interstitial tissues which constitute so prominent a lesion of chronic diffuse nephritis.

Cracow, Maximoff, Davidsohn, and others have shown that it is possible to produce amyloid changes in the kidney by repeated injections of the filtrate from cultures of the golden coccus, readily in the hen, less readily in the rabbit. The amyloid material so formed corresponds closely to that found in man. Herter also used young pigs ten weeks old, two to four ounces of alcohol being given daily. The kidneys after this treatment became large and pale with distended tubules, while the epithelium was granular and fatty; no interstitial changes. It being considered impracticable to produce lesions in the dog's kidney comparable to those in man over a sufficient length of time or with any degree of certainty, it was decided to study only the changes following decapsulation of the normal kidney, and in two cases the effect on the perirenal circulation, first, of the ligation of the renal artery of one kidney with decapsulation of the other, and secondly, of simple unilateral nephrectomy. In neither case was the perirenal circulation appreciably increased.

Edebohls draws these conclusions from his operations on patients suffering from chronic Bright's disease in which the method of decapsulation has been employed.

First. That chronic Bright's disease can be cured by decapsulation of the kidneys in a large percentage of cases.

Second. That the cause of the cure lies probably in the establishment of a collateral circulation between the blood-vessels in the adhesions and those of the kidney. Schmitt, in a very able review of the clinical evidence (*New York Medical Record*, September 13, 1902), raises the following points in objection to Edebohls' first conclusion:

1. Included in Edebohls' cases are some operated upon for movable kidney in which chronic nephritis was diagnosed, and that as a movable kidney by tension on the vessels may become congested, the presence of casts and other alterations of the urine found in chronic Bright's disease is not unusual.

2. That in most of the other cases a sufficient length of time had not elapsed to make the claim of the cure of the disease a justifiable one.

3. That in a large proportion of his cases, Edebohls claims that one kidney alone was affected; whereas Kummel and Strauss have found that it is bilateral in every case of Bright's disease examined by them, basing their conclusions on ureteral catheterization.

4. That in Edebohls' case, and two reported by Furguson where a small portion of the cortex was removed for examination, the section of tissue taken was not sufficiently comprehensive to allow of a positive diagnosis.

As to the theory of Edebohls, that the benefits sometime derived from this operation are due to the establishment of a collateral circulation, I will advance the opinion of Israel and Pousson, who believe that it is due to relief of tension from splitting the capsule of the kidney. Israel disclaims all intention of surgically treating Bright's disease, only employing operative measures when it gives rise to otherwise intractable symptoms of hæmaturia and colic, which furthermore must be traceable to one side only. Dr. A. Pousson, from twenty-three cases by different surgeons, concludes that nephrotomy or nephrectomy may be indicated (*a*) in chronic nephritis complicated with hæmaturia, (*b*) with nephralgia, (*c*) in subacute infectious nephritis, under this head classing the cases of R. Harrison, (*d*) in acute infectious nephritis; miliary abscesses of a kidney and movable kidneys with pyelonephritis are included in this division. Pousson believes that there is a sympathetic relation between the kidneys as between the eyes, and that an operation upon one will frequently relieve the condition existing in the other. He uses protracted drainage in all his cases.

Harrison employs renipuncture or division of the capsule, and gives the following indications for their use.*

* These indications, given by Schmitt in his article summarizing Harrison's opinion as to when operation is advisable, are so well condensed that I have here quoted them verbatim.

1. Suppression of urine with alarming symptoms in scarlatinal nephritis.
2. Progressive signs of kidney degeneration as shown by the persistence or increase of albumen.
3. Where a marked disturbance of the heart and circulatory apparatus arises in the course of inflammatory renal disorders.

The second conclusion of Edebohls, namely, that the improvement is due to the formation of new blood-vessels which anastomose with those of the kidney, has so far not been confirmed by evidence from the autopsy table. Furthermore, it has been shown that added demands on the circulation of one kidney caused by the removal of the other, either with or without decapsulation of the first, does not in the dog produce an increased vascularity of the perirenal tissues.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, January 14, 1903.

The President, LUCIUS W. HOTCHKISS, M.D., in the Chair.

CHOLECYSTECTOMY.

DR. ALEXANDER B. JOHNSON presented a woman, forty-eight years old, who was admitted to Roosevelt Hospital last August. She stated that for upward of fifteen years she had suffered from attacks of illness which were referable to the biliary passages. These attacks were characterized by vomiting, pain in the region of the liver and radiating into the right shoulder, and many of them were accompanied by jaundice. The attacks gradually increased in severity.

When the patient was admitted to the hospital, she was suffering from an acute attack which had then lasted about five days. She complained of severe pain over the region of the gall-bladder, radiating towards the right shoulder, and she vomited almost continuously. She was not jaundiced. The abdomen was tympanitic, and there was some rigidity of the upper right rectus muscle. The liver could not be felt to be enlarged, but the region of the gall-bladder was extremely tender. There was slight elevation of temperature, and an examination of the blood showed a moderate leucocytosis. There was no bile in the urine.

With the exception of a slight degree of anæmia, the patient's general condition at the time of her admission was very good, and an operation was done the following day. A straight vertical cut was made opposite the border of the right rectus. Upon opening the peritoneum, the gall-bladder was found to be much enlarged; it was tied down by adhesions, and upon separating these it was found to be at least half buried in the liver tissue. It was evidently much distended, and numerous stones could be

felt in its interior. An aspirating needle was introduced, and the fluid withdrawn consisted of slightly bile-stained bloody pus. The removal of the gall-bladder was accompanied by considerable hæmorrhage, on account of the necessity of cutting into the liver tissue. The bleeding was controlled by temporary packing. After the adhesions of the gall-bladder to the liver had been separated and the hæmorrhage controlled, the rest of the operation was quite easy. The cystic duct was cut off as low down as possible, and at that point it was found to be patent. The stump of the duct was inverted and closed by means of a purse-string suture in a similar manner as was usually followed in dealing with the stump of the appendix. With the exception of a small drainage tube placed in the site of the cystic duct, the wound was closed entirely.

The patient did not require any stimulation at all during or after the operation, and, with the exception of a severe and prolonged attack of vomiting, she made a very good convalescence. Since then she has enjoyed excellent health, without any recurrence of her former symptoms.

A pathological examination of the gall-bladder showed that its contents consisted of bile and a cloudy fluid containing blood, pus, and cholesterin. It also contained eighteen light-colored calculi, the largest of which weighed fifteen and one-half grammes. It was found that the mucus coat of the gall-bladder had been entirely destroyed by the inflammatory process, and the fibrous coat was somewhat atrophied.

DR. HOWARD LILIENTHAL said he had done thirty primary operations upon the gall-bladder, twenty-three of them since the first of last January. About eight or ten of these were interval cases. The patients were of various ages, the youngest eleven years old. The operations were done for various reasons, usually calculi. Cholecystectomy was resorted to for cholelithiasis, cholecystitis, gangrene, empyema of the gall-bladder, and various other complications. The speaker wished to emphasize the fact that the operation of primary cholecystectomy, in his opinion, was safer, and was followed by a lower mortality than that of cholecystotomy. He had removed gall-bladders which had gangrenous patches scattered over their surface and extending through to the peritoneum. Some were gangrenous to such a degree that they had to be removed piece-meal. Among his thirty cases he had

had one death, and in that instance the patient had suppurative cholangitis and a left subphrenic abscess, the presence of which had not been suspected. Cholecystectomy was particularly preferable to cholecystotomy in those cases in which there was danger of infection, and especially in the gangrenous type of gall-bladder disease. Such a gangrenous gall-bladder, if left behind, must be regarded as just as great a menace to the patient as a gangrenous appendix. It was located in a region of the abdomen where absorption and general infection were very apt to occur. After the removal of a gangrenous gall-bladder, the patient usually experienced a condition of relief rather than one of shock. Without going into the question of technique, Dr. Lilienthal said that often he could remove the gall-bladder without danger through a two-inch incision. The incision of choice was a vertical one through the middle of the rectus. This had never, in his experience, resulted in a hernia nor in weakness of the abdominal wall, perhaps because the points of entrance of the intercostal nerves into the rectus muscle were not injured.

DR. ROBERT H. M. DAWBARN said that another and a self-evident point in favor of cholecystectomy was that after such an operation the patient would never again suffer from gall-stones, whereas a cholecystotomy offered no such guarantee. An extremely important point in connection with the drainage of these cases was that suggested by Dr. Mayo, of Rochester, Minn.; namely, that the gauze strip inserted for drainage should be fastened in place by a single catgut stitch, so that it could not become displaced by the movements of respiration. This should be done in every instance where drainage was considered necessary. Without this point, the drainage-strip *may* remain where placed; but with this point, displacement is impossible.

DR. JOHNSON said he agreed with Drs. Lilienthal and Dawbarn that cholecystectomy was preferable to cholecystotomy, and for the past two years he had resorted to the former operation in every case of gall-stones in the gall-bladder, and where that organ appeared to be at all a part of the disease complex. During the past year he had done cholecystectomy six or seven times without any mortality from the operation. As to the choice of an incision, whether it was made through the rectus or at its outer edge, he did not think the nerves were necessarily injured. Care should be taken in making the cut, and the nerves pushed out of the way.

While a cholecystectomy was a more difficult operation than the mere drainage of the gall-bladder, still, the treatment of the cholecystectomy wound was quite simple and the after-results of the operation were much better. He had not found it necessary to stitch the gauze or other drainage to the seat of the incision in the common duct after operations on that tube, nor had he found it necessary to do this after removal of the gall-bladder. In the only fatal case of gall-stone operation that he had met with, death resulted from a hæmorrhage into the subcutaneous tissues from a very small vessel. For the purpose of drainage he was not in the habit of employing gauze, but a small rubber tube, which was stitched or pinned to the edge of the abdominal wall. He had not found it necessary to keep the wound open very long.

NEPHRECTOMY FOR TUBERCULOSIS OF KIDNEY.

DR. JOHNSON presented a woman, thirty years old, who had enjoyed good health until three years ago. She then began to have pains in the region of both kidneys, particularly the right. Urination was increased in frequency, and the act was accompanied by considerable burning pain. There was polyuria, but no history of hæmaturia. The patient lost considerable weight. She had no pulmonary symptoms, nor had she ever suffered from night-sweats.

Her symptoms gradually increased in severity, and when she entered the hospital last July, she was pale and anæmic. An examination of the chest gave no positive signs. The right kidney was enlarged and tender. The left kidney was not tender, but could be palpated fairly well. She had moderate fever and leucocytosis. The urine contained albumen, pus, and blood, but no tubercle bacilli were discovered. Upon the 31st of July the right ureter was catheterized: its vesical orifice was reddened and swollen, and appeared to be the seat of a tubercular ulceration. The orifice of the opposite ureter was apparently normal. The urine from the right kidney contained considerable blood, some pus and albumen, but no tubercle bacilli were found.

The right kidney was exposed through an incision made parallel with the ribs. Through such an incision, which could be extended a greater or lesser distance forward, according to the necessities of the case, a very good exposure of the kidney was obtained. The pedicle was well exposed, and was divided before

proceeding with the enucleation. The kidney was found to be notably enlarged and very red and congested. Its surface did not show any pronounced lesions. It was removed without much difficulty. The patient made an uneventful recovery, and left the hospital on the seventeenth day. After the operation she passed an abundance of urine, and within a few days the character of the urine became clearer and better, pathologically. Since then her condition had steadily improved and her urinary symptoms had subsided entirely. There was no frequency, and the urine was entirely clear.

A pathological examination of the kidney which had been removed revealed the presence of numerous miliary tubercles, both singly and in groups. Near the centre of the organ was an area of caseation. There was distinct enlargement of the ureter and thickening of its walls.

In reply to a question, Dr. Johnson said that, after dividing the ureter, he cauterized the cut end of the lower segment and then inverted it.

DR. WILLY MEYER said that in one case of tuberculosis of the kidney where he had removed the kidney, he failed to tie the upper end of the ureter. With the cystoscope it had been shown that the respective mouth of the ureter was ulcerated. For a number of weeks after the operation there was a great deal of urinary discharge through the nephrectomy wound. Evidently the urine from the opposite kidney entered the orifice of the ureter of the diseased side, which was permeated in a retrograde direction on account of the ulceration, and then ran upward into and out of the wound. After exposure of the renal ureteral segment, and after cauterization and ligating its cut end, the lumbar sinus promptly closed. This experience showed the wisdom of tying off the ureter after nephrectomy for tuberculosis.

LOOSE CARTILAGE IN KNEE.

DR. JOHN F. ERDMANN presented a woman, twenty-one years old, who gave a history of an attack of infantile paralysis seventeen years ago. For three years after the occurrence of that attack she was unable to walk. At the age of thirteen she received an injury to the right eye, permanently destroying sight on that side.

During the past five years the patient gave a history of fre-

quent attacks of internal derangement of the right knee-joint. There was no history of any injury. Examination of the knee showed a deep sulcus over the internal tuberosity of the tibia on the anterior surface, with an occasional presentation of what appeared to be a cartilage. This readily slipped from under the fingers.

On December 12, 1902, a semilunar incision was made on the inner side of the anterior aspect of the joint. Upon opening the joint, a displaced semilunar cartilage was found, lying well back in the joint. It was perfectly free from all anterior and lateral attachments. This was removed, the joint was closed without drainage, and the patient left the hospital within ten days. Since that time she has had absolutely no manifestations of her former difficulty.

GUNSHOT WOUND OF SKULL; LACERATION OF THE SUPERIOR LONGITUDINAL SINUS.

DR. ERDMANN presented a man, twenty-six years old, a porter by occupation, who was admitted to Gouverneur Hospital on April 28, 1902, with the history of having been accidentally shot, the bullet entering the head in the median line, just above the forehead.

Upon admission, the patient was unconscious, and there was apparent loss of power on the left side. His breathing was slow and regular; temperature, 99.5° F.; pulse, 52, irregular in character. There were two wounds in the scalp; these were three-quarters of an inch apart, irregular in contour, and about the size of a 32-caliber ball. The skull was comminuted, and the bleeding was so profuse that a rupture of the longitudinal sinus was suspected. Upon removing the fragments of bone, a terrific hæmorrhage occurred, which was traced to a large tear in the superior longitudinal sinus. Owing to the severity of the bleeding, the wound was hurriedly packed with sterile gauze and the scalp flaps drawn together and sutured over the packing. The patient was sent to bed in a poor condition. There was no improvement in his semiconsciousness, and the paralysis remained unchanged.

On April 30 the sutures in the wound were removed, together with the packing, with the idea of doing further work; but another fierce hæmorrhage occurred and the wound was again packed. Two days later the packing was again removed, and

while the bleeding was less severe, nothing could be done but to repack the wound. On May 5 there was no hæmorrhage when the packing was removed, but the patient's condition did not warrant any further interference, although the paralysis of the left side was gradually deepening.

On May 11, as the paralysis was still present and the patient was unable to recognize any one or to speak, it was decided that the motor cortical area of the right side was being compressed, in addition, in all probability, to its primary laceration produced by the bullet in its course. During this period, the patient's pulse never rose above 80, and usually ranged between 52 and 70. The temperature varied from 100.4° to 102.6° F., and usually remained between 100° and 101.6° F.

On May 11 a horseshoe incision was made over the motor area on the right side, and an omega-shaped flap of bone was raised. The incision through the scalp was accompanied by a very profuse hæmorrhage, which was controlled with difficulty. Upon exposing the dura, which presented a dark, bluish color, no cerebral pulsation was evident. The dura was incised, and a three-ounce blood-clot evacuated, with some brain tissue. This blood-clot was removed by the use of a blunt uterine curette. The track of the bullet was evident by the laceration of the brain tissue at this point, and readily admitted a piece of drainage tube half an inch in caliber. The track of the bullet as well as the cavity made by the clot were washed out with saline solution, and the incision in the dura was sutured, with the exception of one small point where a piece of rubber tissue drainage was placed so as to communicate with the track of the bullet.

The effect of the operation was immediate. When the patient recovered from the anæsthetic, he talked rationally and was able to recognize his friends. The following morning he asked for food and drink. Sixteen hours after the operation he was able to move his left thigh and leg, and the paralysis of this extremity disappeared entirely within three days. The first effect of the operation upon the left upper extremity was observed after a week had elapsed, when it was seen that efforts at abduction and adduction of the arm and flexion and extension of the forearm were made. The condition of the upper extremity improved daily, so that by the end of July the patient was able to use his left arm to very good advantage. At least 60 per cent. of its normal

power had been restored. By September all its functions were restored excepting complete supination of the forearm and abduction of the arm. Flexion and extension of the fingers, while present, were not strong. At the present time there was still slight impairment of supination and abduction of the arm and flexion and extension of the fingers.

DR. DAWBARN said that on account of the repeated hæmorrhages which Dr. Erdmann had to contend with, it appeared to have been a favorable case for the carrying out of a suggestion which was made in the *New York Medical Journal*, in 1887, by Professor Webster, and first employed by the speaker, namely, to cord the extremities so as to limit the supply of blood in the head. The speaker said he had employed this procedure, for example, with marked success in a case of Graves's disease where he tied off the four thyroid arteries. The veins were enormously distended everywhere in the neck, and this promised an ugly degree of hæmorrhage while operating. But by accumulating blood in the limbs for five minutes or so before operating, the neck ceased to be congested, and the cutting was done safely, where otherwise this would have been impossible. Dr. Dawbarn added, that this case taught an obvious lesson of value in many head and neck operations.

In regard to the kind of gauze used for packing, Dr. Dawbarn thought it would be advisable in all such cases to employ the non-absorbent variety. A non-absorbent, sterile gauze, made in various widths, is prepared by Johnson & Johnson. This is equally as effectual as the absorbent in promoting clotting by its mere contact, and it may make all the difference between life and death, by saving some ounces of blood in a case on the verge of shock. Absorbent gauze invites bleeding until it has become saturated. Referring to the use of a plate for the purpose of covering the gap left in the skull, in Dr. Erdmann's case, the speaker said he had found an excellent material for such plates in the shape of celluloid which was specially prepared for him by the Arlington Chemical Company of New Jersey. This resembles in general appearance a slightly yellowish window glass. It differs from the ordinary celluloid in that the nitric acid is most carefully eliminated, thus rendering it non-irritating; and a small quantity of synthetically prepared urea is added to make it elastic, instead of employing camphor for this purpose,—which latter in the

necessarily considerable amount is rather an irritant. Immediately after boiling this plate can be bent to a dome-shape, which is advisable where it must replace a large surface of skull. It should rest upon the vitreous table, the outer table being slightly the more chiselled away to permit this. While hot, it whittles like soft pine. Being transparent, it is easy to scratch upon its surface the exact shape desired, as seen through the plate in place; and then with great speed the shaping is accomplished. The writer considers, from his experience, this material ideal for this purpose.

DR. WILLY MEYER said that some years ago he implanted in a case of Jacksonian epilepsy an ordinary large celluloid plate under the scalp, and when he removed it, for special reasons, about a year later, it apparently had undergone no change whatever. He did not think it was always necessary to use a specially prepared kind of celluloid, such as Dr. Dawbarn had described. The patient had been repeatedly presented before the Society.

TUMOR OF THE BRAIN.

DR. OTTO G. T. KILIANI presented a man, thirty-two years old, who came under observation September 19, 1902. His family history was negative, and his previous health had been excellent. His habits were good; there was no history of syphilis or alcoholism.

A year previous he had an attack of partial deafness; this gradually passed off and no attention was paid to it. In June, 1902, while lifting a fender from a trolley-car, he suddenly felt faint and became dizzy; he was very pale and unable to speak. He was assisted to the sidewalk, but recovered after a time and was able to go home alone. He recovered his speech somewhat, but not with the former fluency. This difficulty of speech has steadily been increasing. There was no vomiting at any time. Subsequently, severe headaches developed, usually frontal, but often general. His sight gradually became poorer.

Two weeks before he came under observation he had another attack. There was sudden numbness of the right hand, and the hand became pale. This pallor of the right upper extremity was very pronounced, and the speaker said he looked upon it as a rather unusual vasomotor symptom. Following the numbness of the right hand, the foot on the corresponding side became numb. The patient seemed dazed, and complained of a very intense

headache. The attack lasted about five minutes, and when he recovered from it his right hand, arm, and leg seemed weaker than before, and his speech was still further impaired. On September 17 he had a third attack, which was characterized by numbness beginning in the right hand and extending to the arm; saliva drooled from the right side of the mouth, then the numbness extended to the right leg, and the patient became unconscious for a few minutes. These observations were made by the patient's wife and could not be absolutely relied upon. When he recovered consciousness there was intense headache. There was no vomiting.

An examination of the patient's eyes showed that the pupils reacted to light and accommodation; there was no impairment of muscular power and sight was not diminished. The man's speech was slow and stammering in character. He recognized objects and knew their names, but he found it difficult to speak a sentence. An examination of the heart, lungs, liver, and spleen proved negative. There was apparent impairment of the pain and tactile senses in the region of the right arm and leg, together with muscular weakness. The right side of the face was similarly affected. The knee-jerk on the right side was increased. With the exception of a faint trace of bile, the urine contained nothing abnormal. On September 24, when the patient was seen by Dr. George W. Jacoby, his symptoms were practically unchanged, excepting that the right foot dragged a little and there was distinct right-sided facial paresis. On the following day he had an attack similar to those already described. The symptoms indicated a subcortical brain tumor located on the left side under the arm and speech centres, and growing outward.

On September 26 the patient was admitted to the German Hospital. At that time there was distinct facial paralysis, aphasia, and weakness of the right hand and leg. The ophthalmoscope showed a beginning optic neuritis on both sides.

On September 30, two X-ray pictures were taken of the patient's head, both of which showed a distinct opaque area over and around the lower Rolandic fissure. Dr. Kiliani said he had shown these plates, as well as the prints made therefrom, to Dr. Robert Abbe, who was not inclined to believe that the opaque area indicated the presence of a tumor, and said he had seen similar shadows produced by slight moisture on the X-ray plate.

In order to verify this observation, Dr. Kiliani said he had made a number of experiments in connection with X-ray work upon the human head, moistening the plate in some instances, and in others the patient's hair, but he had never been able to get a shadow at all similar to the one obtained in the case under discussion, just as he never got any shadow from moisture of feet standing on plates. He was unable, therefore, to agree with Dr. Abbe's opinion in this instance, and was sure that the opaque area shown in the two plates constituted a sufficient proof that it is the shadow of the tumor. The only method by which he could explain this radiographic demonstration of a soft brain tumor was to take the skull and its contents as a physical unit; if there was any plus to that unit, he saw no reason why, under favorable conditions, this increased density could not be demonstrated by the X-ray. He was convinced that if a tumor of the brain was under- or over-exposed, it would not show on the plate.

The patient was operated on by Dr. Kiliani, October 7, 1902.

Horseshoe flap of cranium with base above the ear was made by means of Doyen drill and Gigli saw, extreme difficulty being encountered owing to the thickness of skull and densely adherent dura. Exposure of dura revealed a distinct bulging a little below the middle of the parietal lobe. Electrical excitation over entire motor area gave no response. Curved incision in dura, parallel with but within craniotomy line, allowed laying bare of cortex, presenting parietal and part of frontal and occipital convolutions. Direct electrical stimulation over motor area again gave no response. After reflexion of dura above mentioned bulging disappeared, palpitating finger discovering no hard mass. Aspiration also negative. Incision two inches in length was then made in sagittal direction over the suspected place through the cortex. Exploring finger finally found tumor situated one-fourth to three-fourths of an inch underneath surface, densely adherent to surrounding structures and apparently pediculated below, where its vascular supply was obtained. Blunt enucleation of tumor by the finger was followed by considerable bleeding from brain substance. The tumor presented the shape and size of a small hen's egg, being one and seven-eighths inches long and one and five-eighths inches broad.

Small gauze packing into cavity, replacement of dura and cranial flap, a narrow strip of gauze being led through a drill-

hole. The loss of blood was so extensive that a saline infusion became necessary.

Seven hours after the operation the man showed signs of returning consciousness, and at the expiration of fourteen hours he plainly pronounced the first word he had been able to speak for five weeks. On the fifth day, when the packing was removed, a considerable prolapse of the brain occurred, and the opening was closed with some difficulty. There was also some difficulty in the coaptation of the skull-plate, and this resulted in slight necrosis; otherwise, the patient's recovery was uneventful. On the seventh day he began to use the affected arm and leg, and since then the improvement has steadily continued. He still drags the leg slightly in walking, nor has he regained the full use of his arm. His speech is fairly good, but still impaired to some extent. His facial paresis has practically disappeared. His intelligence did not seem to have suffered at all.

The pathologist who examined the tumor pronounced it a gliosarcoma, composed of small round and spindle-cells, which rendered the ultimate outlook of the case not very hopeful.

AMEBIC COLITIS TREATED BY FLUSHING THROUGH THE APPENDIX.

DR. ROBERT H. M. DAWBARN presented a man, twenty-five years old, who was admitted to the City Hospital September 15, 1902. His family history was unimportant. As a child, he had suffered much from summer complaint. He gave no venereal nor specific history, and for the past five years he had not used alcoholic stimulants in any form. Previous to that time he took an occasional glass of beer. He was a heavy cigarette smoker. He had never had any regular occupation until 1898, when he enlisted in the United States Army and was sent to the Philippine Islands, where he remained for two years and eight months. A year ago, while on duty in the Philippines, he contracted pneumonia, and remained in bed for ten days. During this illness his bowels were loose, averaging four or five formed stools a day. Since that attack he had never been entirely well. Last March he was in a hospital in San Francisco for two weeks with an attack of dysentery. He averaged between fifteen and twenty small, watery stools daily; these contained blood and mucus. When he left the hospital his condition was much improved, having only three or

four movements a day. When he came to New York he had a similar attack, which lasted six weeks. He was treated in the City Hospital from June 30 to September 8, 1902. When he left the hospital he was improved, but he returned a week later, stating that his trouble had recurred three days before. At that time he was having about half a dozen small, watery, blood-streaked stools daily. He did not complain of much tenesmus or abdominal pain, but of headaches and nausea. He was again placed under treatment, but without much improvement. The faecal dejecta were examined by the pathologist of the hospital, and this established the amœbic nature of the trouble.

As the abdominal tenderness now extended over the entire area of the large intestines, it seemed wise to try irrigation of this whole tract, beginning at the cæcum. In order to accomplish this, the technique which was described by Dr. Robert F. Weir in a paper read before the Surgical Section of the American Medical Association at its last meeting was adopted, *i.e.*, irrigation through the lumen of the appendix. The steps of the procedure were as follows: Through the McBurney muscle-splitting incision the meso-appendix was exposed and separated from that organ. The appendix was then drawn up rather snugly, bringing the cæcum in contact with the belly-wall. The split muscles were closed by chromic catgut sutures as closely as safety to the circulation of the appendix permitted. Differing from the practice of Dr. Weir, in the only case which he had thus far recorded, it was deemed safer to defer opening the tube until twenty-four hours had elapsed; meanwhile, a catgut stitch upon either side through its muscular wall and the skin prevented its slipping back. The following day the organ was cut across. This was done at a point about one centimetre above the skin, and the end was split into four very brief flaps, which were turned back and attached to the skin.

The operation was done December 10, 1902, and through this opening in the appendix irrigation of the large intestines was at once begun. A 1 to 10,000 solution of permanganate of potassium (ten pints) was given, alternating, every six hours, with the same quantity of normal salt solution, at a temperature of 120° F. At first a rather sharp-pointed glass cannula was employed in making the irrigations, but this, through the carelessness of the orderly, pierced the appendiceal wall (fortunately,

near the skin surface) after a few days, and could no longer be introduced. This trauma healed within a few days, during which the appendix was let alone; and subsequently a soft-rubber catheter of small caliber was substituted for the glass cannula and no further trouble occurred.

The result of the treatment thus far, Dr. Dawbarn said, had been highly satisfactory. The soreness along the large gut had practically disappeared, and the amœbic character of the discharge was wholly at an end. When the cure was complete, the speaker said, he intended to dissect down about the appendix, stretch and invert it without opening the peritoneal cavity; just as in his technique in appendicitis work, except that he could not put the surrounding purse-string suture in the cæcal walls. It was a question whether or not the method suggested by Dr. Weir was preferable to that of the Kader technique, in the wall of the cæcum or ascending colon, as suggested by Dr. Gibson. Only further experience would determine that point.

Dr. Dawbarn, in closing, said that the present case was one that chanced to be very favorable for Dr. Weir's method, having an appendix of large caliber and with well-developed, thick walls. In numerous appendices ordinarily met with the plan would probably not prove so simple, because of very small caliber or strictures, etc.

DR. F. KAMMERER emphasized the importance of putting the bowel completely at rest in the treatment of these obstinate cases of colitis. He thought the result would not be as good if the feces were allowed to travel through the colon. The speaker referred to a case which he showed at a recent meeting of the Society where he had established an artificial anus, with spur formation, for about three months.

DR. WILLY MEYER said he had recently followed Dr. Weir's method in a case of syphilitic ulceration of the large intestine and rectum, with hæmorrhages. In that case he did not strip the appendix, but stitched the tip of the meso-appendix to the lower angle of the wound. After closing the skin, he opened the appendix and was able to introduce a small, English bougie, followed by a No. 12 soft-rubber catheter, through which the colon had since been irrigated. The opening in the appendix was now flush with the skin, the patient was always clean and dry, and Dr. Meyer said he looked upon the operation as a very satisfactory

one. As an appropriate name for this procedure, the speaker suggested appendicostomy.

EXTIRPATION OF THE ENTIRE COLON, THE UPPER
PORTION OF THE SIGMOID FLEXURE, AND FOUR
INCHES OF THE ILEUM FOR HYPER-
PLASTIC COLITIS.

DR. HOWARD LILIENTHAL presented a woman, twenty-three years old, who was admitted to Mt. Sinai Hospital in the autumn of 1899, in the service of Dr. Morris Manges. The history she gave was that for several years she had suffered from diarrhœa, accompanied by hæmorrhages and the passage of foul mucus from the bowels. She finally became so weak and anæmic that another surgeon had done a left inguinal colostomy for the purpose of giving rest to the lower portion of the colon and the rectum. This operation had revealed the fact that the walls of the bowel were covered with polypoid growths which bled easily, even on gentle manipulation. The patient was much benefited by the operation, and the hæmorrhages finally ceased, so that it was thought best to close the artificial opening. As soon as she left the hospital, however, her old trouble returned. She had as many as twelve stools daily. There was much abdominal pain and some vomiting. The diarrhœa and bleeding were aggravated by the ingestion of certain articles of food. An examination of the rectum disclosed the presence of several polypoid masses.

On December 30, 1899, Dr. Lilienthal opened the caput coli through a wound in the right iliac region, in order to give the entire colon as much rest as possible. Throughout its entire length the colon was filled with polypoid masses. There was no normal mucous membrane, the entire mucosa being covered by large and small papilloma-like excrescences. One of these was removed and examined by Dr. Mandlebaum, the pathologist of the hospital, and proved to be a hypertrophied solitary follicle. After this operation, various irrigations and injections were tried, and the patient improved greatly. The hæmorrhages almost ceased, but it was evident that the closure of the right colostomy wound would be followed by a recurrence of her old trouble. The exclusion of the entire colon from the alimentary tract promised the greatest relief with the least degree of risk. Accordingly, March 6, 1900, an end-to-end ileosigmoidostomy was performed.

Following this, the patient's condition rapidly improved, but she insisted on having the right colostomy wound closed because, even after some months, there was a copious discharge. This necessitated the total extirpation of the colon and the stump of the ileum. This operation was done June 15, 1900, and since her recovery from that operation the patient has been perfectly well. Immediately following the last operation, she had numerous liquid stools daily, but the number gradually diminished, and now she usually has two formed stools daily. Since the operation she has had one slight attack of constipation, which yielded to a mild cathartic.

In connection with this patient, Dr. Lilienthal showed the section of the gut removed. He stated that in January, 1901, he presented the patient at a meeting of the Surgical Section of the New York Academy of Medicine, and a full report of the case was published in "American Medicine," Vol. i, page 164.

DR. KAMMERER said the fact had frequently been demonstrated that, in spite of the removal of extensive portions of the large intestine, the bowels eventually became regulated. The speaker said he had under observation at the present time a patient in whom he excluded about seven feet of intestine, including the ascending and most of the transverse colon, and in spite of this the bowels only moved once or twice a day after several months had passed. Dr. Kammerer thought that in the majority of such cases an ileocolostomy, eventually an ileosigmoidostomy, was the preferable operation. He thought that in the non-malignant cases there was no necessity for the application of so radical a measure as the extirpation of the entire colon, more especially as we know that exclusion of the intestine is followed by atrophy of the excluded portion and, in consequence, by a marked diminution in the secretion from the mucous membrane of the latter.

PERFORATED GASTRIC ULCER.

DR. BENJAMIN T. TILTON presented a man, thirty-nine years old, who was admitted to the Lincoln Hospital November 3, 1902. His family history was negative and his habits were good. During the past six or seven years he had several attacks of abdominal pain; these usually lasted about a week and were accompanied by tenderness on pressure and vomiting, the vomitus being very acid. The pain was most severe in the epigastric region, and

usually came on after eating. His last attack began September 15, 1902. The patient was under treatment at this time, but there was no apparent improvement in his symptoms. He lost flesh and became very anæmic, and on the 1st of November he was obliged to give up his work, which was that of a truckman. On that day he was not feeling as well as usual, and about three o'clock in the afternoon he felt a sudden, sharp pain in the epigastric region. He was obliged to lie down, and said he "felt as though some of his organs were being turned around." He was nauseated, but could not vomit. On the following two days he was treated by his family physician; but his symptoms growing worse, he was removed to the hospital just forty-eight hours after the onset of his attack.

Upon admission, his temperature was 101° F.; pulse, 120. An examination of the heart, lungs, and liver was negative. The abdomen was distended and tympanitic, especially in the right hypochondriac region. No mass could be made out. The appearance of the patient indicated that he was a very sick man, and apparently suffering from general peritonitis, probably due to perforation of an ulcer of the stomach.

Two hours after his admission (fifty hours after the onset of his acute symptoms) the patient was placed on the operating table. A median incision was made, extending from about an inch below the ensiform cartilage to below the umbilicus. Through this opening a large amount of gas and turbid fluid escaped. The intestines were distended and congested, and everything pointed to a progressive general peritonitis. There were no adhesions. The viscera, particularly the liver, were covered with lymph. A small perforation was found on the anterior surface of the stomach, close to the pylorus. It was surrounded by an area of indurated tissue, evidently belonging to a gastric ulcer. The edges of the perforation were inverted, and two rows of Lembert sutures were inserted. A portion of the omentum was then sewn over it. The abdominal cavity was flushed with saline solution and carefully sponged out. The peritoneum was brought together with catgut and the abdominal wound closed, with drainage. When the patient was sent to the ward, his pulse was 160 and very feeble, but he finally responded to active stimulation and made a fairly quick recovery. For six days he was sustained by rectal feeding, and then began to take fluid nourishment by the

mouth. His highest temperature after the operation was 101.6° F. on the third day; it reached the normal on the eighth day, and from that time on his convalescence was uninterrupted. The abdominal fistula was slow in healing, but there have never been any signs of leakage from the opening in the stomach. The patient gained twenty pounds in weight since the operation, and since that time he has had no symptoms referable to the stomach.

Dr. Tilton said the above case seemed rather unusual on account of the indefinite history of gastric ulcer preceding the perforation, and also because of the successful outcome of the operation in spite of the fact that fifty hours had elapsed since the perforation before an operation was done. In a recent collection of 103 cases of perforated ulcer of the stomach made by Mikulicz, the mortality of the operation was 39 per cent. in those cases where it was done within twelve hours after perforation; of those operated upon between twelve and twenty-four hours after perforation, the mortality was 76 per cent., and of the later operations, 86 per cent. In his case, Dr. Tilton said, the small size of the perforation was a favorable factor.

GENERAL PERITONITIS, PROBABLY OF GONORRHOÆAL ORIGIN.

DR. TILTON presented a woman, twenty-one years old, who was admitted to the Lincoln Hospital November 14, 1902. She had been ill for one week. Her family history was negative. She denied gonorrhœa and syphilis. A year ago she had an attack of rheumatism, her description of which gave rise to the suspicion that it was an arthritis of gonorrhœal origin. There was no history of an abortion nor any interruption of the menstrual periods, but during the past three months her menstruation had been somewhat irregular. She suffered from constipation.

Her present illness dated from November 8, 1902, when she had a sharp pain in the abdomen. Following this, she vomited frequently and had a headache. During the next six days she was unable to retain any food, and felt most comfortable lying down, with her knees and thighs flexed on the abdomen, and the head slightly raised.

At the time of admission to the hospital her temperature was 102° F.; pulse, 120; respirations, 30. She was poorly nourished and anæmic in appearance. The tongue was coated. The heart and lungs were normal. The abdomen was rigid and tender,

especially in the epigastrium and over the region of the appendix. As this organ was the possible source of the trouble, an intermuscular incision was made in the right iliac fossa. The appendix was found to be normal, and free pus was found in the peritoneal cavity. This incision was thereupon closed and a second one made in the median line. This revealed the presence of a great deal of free pus and fibrin, particularly in the lower part of the peritoneal cavity. Upon exploring the pelvic region, the Fallopian tubes were found to be slightly distended and very hyperæmic, and upon pressure pus was extruded from both at the fimbriated extremity. No other evidences of abscess were found. The intestines and uterus were covered with fibrin. Both tubes and ovaries were removed, and the peritoneal and pelvic cavities were thoroughly irrigated with a large quantity of salt solution.

For forty-eight hours after the operation the patient's condition was extremely critical. Her pulse was very weak and rapid; the bowels refused to move, in spite of the administration of calomel and enema, and from time to time she vomited a quantity of greenish fluid. On the third day the bowels moved freely, and from that time on the patient showed signs of improvement. She remained in the hospital thirty-nine days, and was discharged, cured, on December 23, 1902.

An examination of the pus in the tubes failed to reveal any gonococci, but in spite of this, Dr. Tilton said he was inclined to believe that the peritonitis was of gonorrhœal origin. The infection was undoubtedly of recent date, as there were no adhesions nor occlusion of either tube.

TUBERCULOSIS OF RETROPERITONEAL GLANDS.

DR. WILLY MEYER presented a girl twenty years of age who came under his observation last autumn. She was suffering from lymphatic nodes, evidently tubercular in character, in Scarpa's triangle, and a tumor of considerable size could also be made out in the abdomen, to the right of the umbilicus. The patient complained of continuous and severe pain in the region of these growths, and insisted upon an operation.

On October 4, Dr. Meyer made an incision in the femoral region, and came down upon a chain of enlarged glands which extended upward into the retroperitoneal region. The nodes were of the hard variety. After Poupart's ligament had been divided, the retroperitoneal glands were attacked. They were so

adherent that, in spite of every care, the peritoneum was torn. The empty sac of a right inguinal hernia was loosened from its bed, split in two, and used for covering the tears in the parietal peritoneum, which could not be stitched. Three of the enlarged glands were removed from behind the pubic bone with great difficulty, on account of their adhesions to the surrounding vessels. After careful sterilization of the bed of this chain of glands, the wound was closed with gauze drainage.

The patient made a good recovery from this operation, but still complained of pain in the region of the tumor in the abdomen, which was regarded as a package of enlarged retroperitoneal gland. An abdominal incision was made through the right rectus muscle, and, after splitting the anterior layer of the mesocolon, a number of enlarged glands were found, which were removed. Towards the root of the mesocolon more enlarged glands were found, which were also extirpated. After disinfection with iodoform ether, the mesocolic wounds were closed, without drainage, and the patient has improved very much since the operation. She does not experience any more pain, and is able to attend to her duties. The scars are firm, no tendency to hernia.

PERINEAL PROSTATECTOMY.

DR. WILLY MEYER presented a man, sixty-three years old, who gave all the symptoms of an enlarged prostate, and also some which were suspicious of vesical stone. He had had repeated attacks of hæmaturia, with pain and interrupted stream. Through the rectum, the enlarged prostate was easily made out, and the cystoscope revealed an enlarged median lobe and a medium-sized stone. The patient was suffering from marked emphysema and chronic bronchitis, and on that account a general anæsthetic was deemed inadvisable. It was finally decided to do a perineal prostatectomy under local or spinal cocaine anæsthesia. But the Schleich method proved entirely inefficient. Five centigrammes of tropacocaine were thereupon injected into the spinal canal, and under this form of anæsthesia, the operation, which lasted about forty minutes, did not give rise to the slightest degree of pain. In shelling out the enlarged prostate through the perineal wound, the prostatic urethra was torn in part, as it usually was in this operation. After completing the prostatectomy, the vesical stone was removed through the same opening. The patient made an uneventful recovery, and the perineal tube was removed on the

eightth day. He was up two days later. The man now enjoyed excellent health, and was only obliged to urinate three or four times daily. There is not a drop of residual urine.

THE BOTTINI OPERATION FOR PROSTATIC HYPERTROPHY.

DR. MEYER presented a man, forty-nine years old, who gave symptoms of retention of urine. The case was easily recognized, with the help of the cystoscope, as one of prostatic hypertrophy, although no tumor could be felt per rectum. Dr. Meyer said he had recently seen the statement in an article on this subject that if no tumor could be made out through the rectum, then there was no hypertrophy of the prostate. The speaker said he could not endorse that statement, as, according to Motz, fully 33 per cent. of prostatic tumors could not be palpated per rectum.

In the case under discussion the cystoscope revealed an intravesicular prostatic growth and a trabecular bladder. As the result of infection, the patient had developed a unilateral pyelonephritis. On June 18, 1902, he was operated on by the Bottini method. His urinary symptoms immediately improved, but his recovery was delayed by the occurrence of an epididymitis, and subsequently by a marked inflammation of the corresponding testicle, which finally suppurated and had to be removed.

The patient was now able to hold voluntarily from 250 to 300 cubic centimetres of urine, and passed it without any trouble. The quantity of his residual urine had decreased from 410 cubic centimetres to one or two drachms.

DR. HOWARD LILIENTHAL said he usually preferred the suprapubic method for the relief of prostatic hypertrophy, unless there were some special contraindication. He did not hesitate to allow his patient, if old and feeble, to sit up on the third or fourth day after the operation, and to get out of bed as early as the sixth day.

DR. KAMMERER said he had done nine perineal prostatectomies since last June. Some of these cases were complicated by stone, as in the one reported by Dr. Meyer. In one instance, a man aged sixty years, he removed 156 calculi from the bladder after prostatectomy. The speaker thought that perineal prostatectomy would prove the future operation of choice. By that method there was less danger of injuring the urethra than by the suprapubic operation.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, January 5, 1903.

The President, RICHARD H. HARTE, M.D., in the Chair.

THE DIAGNOSIS OF INTESTINAL INJURY FOLLOWING ABDOMINAL CONTUSION.

DR. ROBERT G. LE CONTE delivered the Annual Address on Surgery, taking as his topic the above subject, for which see page 525.

DR. JOHN H. GIBBON mentioned the case of a boy who was brought to the Polyclinic Hospital in a state of marked shock, he having fallen and struck his abdomen upon the edge of a basket containing thirty-five or forty pounds of meat. When seen one hour after the receipt of injury, the boy was suffering a great deal of pain and his abdomen was rigid. It was thought that operation would later be required, but within five hours the boy was much better and went on to a speedy and entire recovery. This case illustrated the wisdom of not operating during shock. A second case was that of a boy crushed by a trolley-car and seen at the Pennsylvania Hospital soon after his admission at 6 P.M. At that time he was vomiting, but there was no marked rigidity nor pain. At 11 P.M. a telephone message stated that the only prominent symptom had been vomiting, which still continued, there being as yet no local pain nor rigidity. Considering that the symptoms of most value as indicating operation were pain, rigidity, and facial expression, with perhaps increased thoracic respiration, intervention was not regarded as necessary. The following day the patient developed rigidity with abdominal distention, and still had vomiting, which had persisted from the first. Operation revealed the fact that the lower two feet of the

ileum, with the exception of two inches immediately at the colon, were stripped from its mesentery, and that the middle six inches of this portion were entirely denuded of its peritoneal coat. This part of the bowel was gangrenous, but there was no perforation. The bowel was resected, but the patient afterwards died, no aggravation of symptoms following the operation. The cause of death is believed to have been peritonitis. This case impressed Dr. Gibbon with the importance of vomiting as a diagnostic symptom in these cases, and he would regard it as having even more value than that attributed to it by the essayist. The vomiting in the case under consideration was probably due to the stripping of the bowel.

DR. GWILYM G. DAVIS considered intense pain and rigidity as being symptoms indicative of a grave lesion in cases of abdominal contusion. If the surgeon waits until peritonitis sets in, the evidence will of course be more positive, but the two symptoms mentioned, with possibly vomiting, may be looked upon as the earlier symptoms that are indicative of a grave lesion necessitating operation.

DR. HENRY R. WHARTON emphasized the principle of not operating in the early stages of shock. He had seen many cases appear unfavorable for a few hours, but afterwards go on to uneventful recovery. These cases of contusion are most difficult ones to decide. Rigidity and pain after the subsidence of shock are valuable in guiding the surgeon to a decision.

DR. GEORGE G. ROSS, in commenting on Dr. Le Conte's statement that he had never seen abdominal injury follow the blow of a fist, mentioned the case of a man who exhibited grave symptoms following such trauma. Operation showed that five inches of the mesosigmoid had been torn loose. The patient recovered from operation, but later died from intestinal obstruction.

DR. JOHN B. ROBERTS believed that obscurity of diagnosis in these cases makes the surgeon timid. His opinion is that we often do not operate early enough. In grave, obscure cases he would apply the same principles that govern the treatment of injuries to the skull. There the scalp is opened to inspect the skull, and if that does not suffice, the skull is opened to allow examination of the brain. In similar abdominal cases make an incision, under cocaine if necessary, that will admit of one or two

fingers, and thus allow determination of the injury present. This procedure may save many patients.

CAPTAIN CHARLES KIEFFER, U. S. A., who had seen the cavalryman mentioned by Dr. Le Conte, said that the high mortality among cavalrymen from abdominal injury was due to the fact that they would disclaim injury from being thrown, and probably not report until peritonitis had begun. He had seen three such cases. He operated upon one man who had been kicked in the abdomen and found a transverse tear of the bladder. The bladder was sutured and the patient recovered. In many cases of abdominal injury a symptom of particular value is singultus. This is especially significant of injury to the upper portion of the intestinal tract.

TRANSACTIONS

OF THE

CHICAGO SURGICAL SOCIETY.

Stated Meeting, January 5, 1903.

The President, JOHN B. MURPHY, M.D., in the Chair.

THE SURGICAL TREATMENT OF ANURIA.

DR. ARTHUR DEAN BEVAN read a paper on the above subject, for which see page 575.

DR. M. L. HARRIS, with reference to the classification proposed by the essayist, suggested as subdivisions primary and secondary anuria. The clinical picture of cases belonging to the two classes was quite different. In the primary anurias many of the patients were sick from the start; but in the secondary anurias patients were frequently up and around several days after the anuria begins. For six or eight days they apparently did not have anuric symptoms, and oftentimes they had a strong and full pulse.

Dr. Harris favored operation as soon as a correct diagnosis was made, or as soon as there was obstruction.

DR. D. S. FAIRCHILD (by invitation), of Clinton, Iowa, reported the history of a man who several weeks ago was admitted to hospital with apparently some renal disturbance, shortly after which he had a severe chill, with a temperature of 104° F. The day after the chill and fever it was noticed that he was not passing any urine. Two days later, the anuria having persisted, it was decided to operate. In the meantime, the right kidney was found to be considerably enlarged and quite tense. Patient apparently was suffering from uræmia. He became delirious, and in this condition was taken to the operating room, the right kidney exposed, and it was found that a good deal of inflammation had occurred about the kidney, which was firmly adherent to the abdominal wall. An incision was made in the lumbar region,

and the kidney felt much enlarged. The kidney was freely incised, but no abscess was found. But there was a suppurative nephritis going on, as indicated by the appearance of some pus on the dressings. A small quantity of urine only escaped, not from any accumulation in the pelvis, but was simply drained from the kidney. Normal salt solution was given per rectum. The next day the patient passed some urine from the other kidney, and in three or four days the quantity of urine secreted became nearly normal. The patient was making a good recovery.

While this case might not be one of the kind mentioned by the essayist, yet it was a fact that the pathological condition in the right kidney came on suddenly in this instance. He was not able to discover any disease of the left kidney, and microscopical examination of the urine made since the operation did not reveal any pus in the urine. On a previous occasion the patient stated that he had a similar difficulty, with chill and fever, during which time the urine stopped flowing, but the attack was not so severe as this one.

DR. WILLIAM JEPSON (by invitation), of Sioux City, Iowa, detailed the history of a woman, forty-six years of age, who, three years previously, suffered from some renal disturbance, the exact character of which was not known. At the time he saw her she had been suffering for eighteen or nineteen hours. There was constitutional disturbance, increased pulse-rate, but not a marked increase in temperature. Each iliocostal region was occupied by a large mass, larger than a cocoanut. She was considerably emaciated, and there appeared to be a distinct lobulation of each of the masses, which were advancing forward to the median line, so that there was not more than three or four inches between the two masses. He thought the woman had an obstruction of the ureters on both sides. At least, this was the only way of explaining the condition. He made an examination of the two masses through an abdominal incision, and found that each kidney was the seat of multiple cysts of the size of cysts of the ovary. The right kidney was exposed through a lumbar incision, and he evacuated probably forty or fifty of these little cysts. The other kidney (the left) was let alone. The patient rapidly thereafter developed symptoms of uræmia, and died the ninth day after the operation.

DR. L. L. McARTHUR said that, in the light of Dr. Bevan's

researches, it seemed possible experimentally to produce reflex anuria. If this was possible, it would then be difficult to classify reflex anuria of that kind under the subdivisions of primary and secondary, as suggested by Dr. Harris. He thought the appropriate question was, What shall be called anuria? Must we consider an absolute anuria, that is, not a drop of urine escaping, or perhaps a few drops, as in the case reported by him at the last meeting, where no urine was to be gotten for two or three hours? Shall that be considered a case of anuria? For if there be only a few drops escaping, the differential diagnosis was far more difficult, because the surgeon might not be sure he had an obstruction, and might believe that the trouble was due to the poor functioning capacity of good renal substance without obstruction, when it might prove, as it did in the speaker's case, to be a partial or almost complete anuria, only a few drops of urine escaping. He doubted if cryoscopy would be of any assistance in a case of true hysterical anuria.

DR. THOMAS A. DAVIS stated that experiments had been made and published recently in the *American Journal of the Medical Sciences*, where the caliber of the renal veins was arrested in their lumina for the purpose of causing passive congestion of the kidney, without lessening the amount of urinary secretion. The author of these experiments concluded that the operation of nephrotomy to establish the circulation, provided the venous congestion be relieved, would not lead to an increase in urinary secretion, and that the operation was not indicated. This author spoke of it being contraindicated in anuria resulting from chronic inflammatory affections of the kidney, but said the operation should be limited to congenital anuria and to obstructive anuria from urinary calculus.

DR. BEVAN, in closing the discussion, said he could not agree with Dr. Harris in advocating immediate operation in cases of obstructive anuria, because in many instances of this form of anuria the obstruction was relieved without operation in the first twenty-four, the second twenty-four, and sometimes in the third twenty-four hours, or even as late as the tenth day. Where the obstruction of the ureter of a single functioning kidney was due to stone, the stone might be passed. One should be careful in analyzing the facts, and wait, say two days, to permit of the possible spontaneous cure of the condition by the passage of the

stone in the obstructive cases. This was the opinion of most authors who had studied the cases thoroughly, and who had had a wide experience.

In regard to the diagnosis, he said he attempted to draw a picture of obstructive anuria, showing clearly the absence of general symptoms, the general well-being of the patient shortly after the beginning of the attack, followed only quite late by marked evidence of the symptoms of uræmia.

Relative to catheterizing the ureters, he said that Israel had gone over this side of the question very carefully, and had come to the conclusion that catheterization of the ureters was of such doubtful value in these cases that it was hardly worth spending the time on, but that surgeons should proceed to do nephrotomy instead.

TRANSPLANTATION OF OMENTUM IN THE OPERATIVE TREATMENT OF INTESTINAL DEFECTS.

DR. EMANUEL J. SENN read a paper on this subject. The omentum plays a great rôle in the reparative process following traumatic injuries of the abdominal cavity, both in the destruction of microbes and protection of the general peritoneal cavity by reason of adhesions with intestines and the parietal peritoneum. While omentum transplantation is a recognized operation as a reinforcement of intestinal suture, the author was impressed with the possibility of the use of omentum for directly covering an intestinal defect. Such a pathological condition following a duodenal ulcer, intestinal tuberculosis, gangrenous cæcum, the result of an appendicitis, where enterorrhaphy cannot be resorted to, by reason of the unreliability of the surrounding tissues in withstanding tension, or where suturing would cause too great narrowing of the intestinal lumen; also where the condition of the patient or extensive adhesions would not permit an enterectomy. The omentum has been transplanted over perforations in the stomach, both in experimental work and in man.

The essayist, after referring to the work of Bennett, Braun, Tietze, Enderlen, and others, reported a series of experiments for the purpose of investigating the possibilities of omental transplantation. The experiments were done under the most favorable circumstances as regards the surroundings for doing aseptic work, but the results were unfavorable. The author stated, how-

ever, that the unfavorable results from the experiments are no criterion of the future value of omental transplantation. The omentum in the dog is thinner than in man, and the adipose tissue is not as abundant nor as vascular, therefore, not as favorable for plastic work. The stomach is apparently the most favorable portion of the alimentary tract for omental transplantation. By reason of its fixed position, the gastric movements do not place as much tension on the transplanted omentum as is the case with the peristaltic wave of the intestines. The great omentum in this region is also found near its attachment, which may also be a favorable factor. The experimental and clinical evidence is abundant proof of this fact. The cæcum is the most favorable portion of the intestinal tract by reason of its slight mobility. It lies in one of the regions most frequently attacked by pathological processes, and the future will demonstrate the adaptability of omentum for defects which cannot be closed by suture. Resection of the cæcum or a lateral anastomosis is a formidable operation as compared with omental transplantation. Primary transplantation of the omentum in gangrenous appendicitis will greatly obviate fæcal fistula, which so often follows the operation. Until more clinical evidence accumulates, showing that reliable suturing can be done, intestinal transplantation of omentum should not be resorted to unless there is abundant drainage down to the seat of suture, besides walling off the general peritoneal cavity.

The author concludes:

1. Transplantation of omentum over defects in the stomach is an established operation.
2. Transplantation of omentum over intestinal defects is recommended, but is still in the developmental stage.
3. Transplantation of omentum over defects in the cæcum is the most favorable portion of the intestinal tract.
4. Transplantation of omentum over defects in the small intestine should only be done after fixation of the segment of the intestine to the abdominal wall.
5. Gauze drainage should be resorted to, excluding the general peritoneal cavity.

DR. E. WYLLYS ANDREWS said the conclusions arrived at by Dr. Senn were exactly those which others had come to in the course of a series of experiments on animals and also from experience in operating. In the dog, after operating with the assist-

ance of Dr. Frank in using his coupler, and after using the Murphy button in demonstrations before the class, and opening the abdomen a few days later, he had more than twice lifted out of the operative field a loop of intestine with a coil of omentum wrapped around it. He said it seemed to have encircled the entire circumference of the bowel.

DR. DANIEL N. EISENDRATH said that he had had occasion, in speaking of the surgical anatomy of the omentum, to speak of its function as a protecting mother. Within the last six months he recalled a case upon which he had operated for appendicitis, where the omentum was fastened to the lower end of the cæcum, like an envelope would enclose a piece of paper, so that it had to be stripped from the lower end of the bowel. He believes that the reason for the apparent failure in conducting the experiments was, as Dr. Senn had said, namely, a difference in the construction of the human and the dog's omentum. Any one who had experimented with dogs would recall the fact that the omentum was almost as thin as tissue paper in young dogs. A point of interest was the omentum in relation to the spread of peritonitis. The omentum divided itself off into two parts,—the so-called supra-omental and the infra-omental portions,—in which suppuration from the appendix had a tendency, on account of the protecting action of the omentum, to limit itself to a portion beneath the omentum.

DR. JACOB FRANK said the omentum of a young dog was very thin, the same as it was in young children. An old dog's omentum, on the other hand, was much thicker and corresponded to that of adults.

DR. ARTHUR DEAN BEVAN could see the value of omental grafting in cases of lesions of the stomach, but he doubted very much its value in lesions of the small intestine and of the colon, with the exception of the transverse colon. He questioned the practical value of utilizing the omentum in such cases. Surgeons knew how omental adhesions might produce intestinal obstruction. Probably the most common cause of intestinal obstruction was adhesion in which the omentum was involved. If the surgeon, in a case of lesion of the transverse colon or stomach, utilized an omental graft, anatomically it was correct. If one used the omentum in a lesion of the ileum, there was great danger of furnishing a cause for subsequent ileus; and in spite of the

great value given to the omentum by many as a protecting structure, as in cases of appendicitis, for instance, he thought it was overdrawn, and the great danger attending its use should be considered.

DR. SENN, in closing the discussion, said it was very seldom a surgeon, outside of the work of appendicitis, was called upon to use the omentum for intestinal fistula. He had seen a number of cases of fistula following cases of gangrenous appendicitis, and had heard of many more; by closing in the defects with omentum, fistula might be obviated. In certain cases of tuberculosis of the intestine, where it was impossible, on account of adhesions, to do a resection, there was nothing else to do but to cover in the defect with something, and he said that in his conclusions he advised, before resorting to transplantation of omentum, first to fix the intestinal segment to the abdominal wall; then, if the omentum was transplanted, there would not be any possibility of secondary intestinal obstruction. He could see the possibility of intestinal obstruction, provided omental transplantation was made and the segment of bowel dropped back into the peritoneal cavity. But if the intestinal segment was anchored, he did not think there would be any danger of secondary obstruction.

CARCINOMA OF THE LARYNX.

DR. ARTHUR DEAN BEVAN exhibited a carcinomatous larynx which he had removed about five weeks ago. In this case he did a complete laryngectomy for carcinoma of the larynx after a tracheotomy had been made, also a thyrotomy. The carcinoma was removed at the second operation, but recurred. Complete laryngectomy was made by the Keen method, a method which he had employed in a previous case exhibited to the Society. The patient had gone on to normal recovery, with complete closure of the pharynx within about three weeks after the operation.

REVIEWS OF BOOKS.

GENITO-URINARY AND VENEREAL DISEASES. By LOUIS E. SCHMIDT, M.Sc., M.D. Philadelphia: Lea Brothers & Co.

This is one of the "Medical Epitome Series" of books edited by Dr. V. C. Pedersen. The author in his preface draws the very appropriate simile between this book, which affords a comprehensive survey within a compact space, and a landscape condensed by the camera and still preserving all the essentials in their proper place and proportion.

This little volume treats with great clearness of venereal and genito-urinary diseases and their complications. The first chapters are devoted to syphilis and chancroid. All of the other diseases are described under the head of genito-urinary affections. Particular attention is given to the remote effects and complications of these diseases. Diagnosis is also given its full quota of attention.

While the book is intended for the medical student, it may also be regarded as an index for handy reference for the general practitioner. It is no longer a heresy to say that these little books serve a useful purpose, and contain as much working information as some larger books with their verbose disquisitions, references, and all-sided views.

JAMES P. WARBASSE.

TEXT-BOOK OF ANATOMY. Edited by D. J. CUNNINGHAM, F.R.S., Professor of Anatomy and Surgery, Trinity College, Dublin. Illustrated with 824 wood engravings from original drawings, many printed in colors. New York: The Macmillan Company, 1902.

This book is the work of ten contributors edited by Professor Cunningham. The distinguished editor and his colleagues

were pupils of Sir William Turner, and dedicate this volume to their former teacher and master. The reverence and love which association with him inspired is thus crystallized in a volume which worthily reflects the teachings of an eminent anatomist.

In the preparation of such a work, it is difficult to preserve the symmetry and balance of the several chapters; thus, we note that some chapters are models of description and replete in detail, while others are brief and almost inadequate.

The chapter on osteology and arthrology is a thorough description of the bones and joints, supplemented by appropriate illustrations. The muscular attachments are shown by colored outline, and the diagrams are such as emphasize the text by the impressions made through the eye.

An important innovation is the emphasis which is placed upon the *architecture* of each bone,—its form, density, thickness of its walls, and adaptation to its special function.

The muscular system is not as fully described as its importance demands, nor is the function of the muscles sufficiently emphasized to impress its importance upon the mind of the student. The nomenclature is thoroughly modern and up to date. We believe that, instead of leaving the nerve supply and action to be tabulated at the end of each group of muscles, it is better to note these under the individual description of each muscle.

The description of the vascular system is, as a rule, brief and inadequate; furthermore, the text might advantageously be elucidated by appropriate illustrations of important anastomoses, such as the ovarian and uterine, and others.

The chapter on the nervous system is a model of excellence in every particular. It is a splendid description of this most complex system, well illustrated, with a proper appreciation of the important and subsidiary details. The same may be said of the chapter on the digestive system. The description of the cæcum and appendix, the topographical relations of the abdominal viscera, show important original investigations by their departure

from the conventional descriptions hitherto in vogue, and give to the book much that is valuable and new. The volume closes with a short but satisfactory chapter on surface and surgical anatomy. The few defects as noted above are more than counterbalanced by the many points of excellence, originality, and scholarly temper which pervade this volume.

WILLIAM FRANCIS CAMPBELL.

DISEASES OF THE SKIN. By ALFRED SCHALEK, M.D. Philadelphia: Lea Brothers & Co., 1902.

This little book is one of the "Medical Epitome Series" edited by Dr. V. C. Pedersen, intended to take the place of the quiz compend. Indeed, it is such an improvement upon the latter that there remains but little resemblance. The value to the student and practitioner of such epitomes has long been recognized. Such epitomization furnishes an aid to a mastery of the essentials of the subject, and serves as a basis upon which a knowledge of details can be built. These works, of course, are adapted particularly to the needs of medical students, but the practitioner need not feel above consulting them.

This particular volume sets forth the essentials of dermatology. It is made a work of ready reference by an alphabetical arrangement of subjects, which we find extending from acne to xanthoma. A brief but lucid description of the pathology of the skin and its anatomy are also given. There is also a valuable table, classifying all of the skin lesions. These come under the heads of inflammations, hæmorrhages, hypertrophies, atrophies, new growths, neuroses, diseases of the appendages of the skin, and parasitic affections.

There are thirty-four engravings. The work would be of service to more men than would be willing to acknowledge that they had any use for so small a primer.

JAMES P. WARBASSE.

INTERNATIONAL CLINICS. Edited by HENRY W. CATTELL, A.M., M.D. Vol. iii, Twelfth Series. Philadelphia: J. B. Lippincott Company, 1902.

This volume is divided into sections on therapeutics, medicine, surgery, obstetrics and gynaecology, and diseases of the eye, ear, and throat. About fifty pages are devoted to surgery.

The effects of fire-arms at short range are set forth in an interesting paper by Dr. John H. Brinton, illustrated with colored plates showing the comparative effects of black and smokeless powder cartridges. The author shows that the discoloration of the skin, where black powder is used, is due to the smut from the barrel of the piece, which after repeated discharges becomes very great; to the smoke, to the heat and flame of burning gases, to partly burned powder, to the ashes of burned powder, and to the partly burned and unburned powder grains driven into the tissues. His studies of the relation of the "brand" or burn to the bullet-hole are interesting in that he has demonstrated that, without exception, the "brand" is on the side of the hole towards the right of the piece. This rule he found invariable in 200 experiments. It is explained by the recoil of the barrel towards the right. When the piece was fixed in a vise so that there could be no recoil, the bullet-hole was in the centre of the "brand." The great medicolegal importance of this knowledge is evident.

Dr. John A. Lewis has a paper on the treatment of fractures and dislocations in relation to suits for malpractice. Dr. James P. Tuttle has reported a lecture on the treatment of internal hæmorrhoids by the clamp and cautery. Dr. J. R. Pennington also has reported a lecture on hæmorrhoids.

In a lecture on the treatment of dilatation of the stomach by gastro-enterostomy, Dr. G. M. Debove, of Paris, in order to map out the stomach, administers six grammes of bicarbonate of soda and four grammes of tartaric acid to accomplish the full distension of the organ. He also calls attention to the value of percussion applied to the abdomen to cause contraction of the stomach to demonstrate its effort to empty itself.

Dr. Antonio Cardarelli has a lecture on the surgical treatment of dilatation of the stomach. He shows that gastrectasia is not necessarily dependent upon pyloric stenosis. He quotes Doyen's statement that all the severe dyspepsias, in which medical treatment has failed, belong to the domain of surgery. The author contends that as soon as simple pyloric stenosis with gastric stagnation has been diagnosed, surgery is indicated. He goes farther, and advises surgery, even if the physician is not entirely convinced of stenosis, if the stomach is not able to completely empty itself and a condition of stagnation exists. He suggests that in many cases the reason that the patient is not turned over to the surgeon is that the physician is not altogether certain of his diagnosis, and he fears that the surgeon's knife will reveal his error. He reports four cases operated upon for this condition by gastro-enterostomy.

Dr. De Forest Willard, in a discussion upon club-foot, reserves astragalectomy for (1) adults with great bony deformity, (2) neglected cases in children of from five to fifteen years with markedly distorted tarsi, (3) relapsed cases or cases which have resisted the milder forms of treatment, (4) and only occasionally in young children with persistently rigid bones, and with little motion either at the ankle-joint or in the tarsus. Astragalectomy, he says, is an operation which would never be required if the family practitioner could be brought to the comprehension that the treatment of club-foot should be commenced before the infant is twenty-four hours old. He prefers to operate without the Esmarch bandage.

Dr. J. M. Baldy's discussion upon the diagnosis of abdominal tumors is very instructive.

The studies of the theory of inflammation, by Dr. Hans Schmaus, are taken from his lecture upon this subject, and represent the newest and best knowledge.

This particular volume is richer in surgical material than many of its predecessors; and the merit of the surgical articles

is such as to enhance the total value of the work. The popularity and value of this class of books are increasing, and authors and editors are learning how to make them better.

JAMES P. WARBASSE.

CELLULAR TOXINS. By VICTOR C. VAUGHAN, M.D., LL.D., Professor of Hygiene and Physiological Chemistry and Director of the Hygienic Laboratory in the University of Michigan, and FRED. G. NOVY, M.D., Sc.D., Junior Professor of Hygiene and Physiological Chemistry in the University of Michigan. Fourth edition, revised and enlarged. Philadelphia and New York: Lea Brothers & Co., 1902.

The perusal of this book in its fourth edition is to be warmly commended to surgeons for the detailed exposition of the phenomena that operate in the blood upon the introduction of bacteria in the system. These teachings are embodied in the chapters on Germicidal Properties of Blood Serum, the Specific Precipitins, the Lysins, Bacteriolysis, Hæmolysis, the Agglutinin; and a due appreciation of their significance will better enable physician and surgeon to understand what is implied in the comprehensive expression, Immunity. This latter topic is finally elaborated in a separate chapter. Whereas the evolution of immunity is very ably rendered, it is rather a synthetical representation than a narrative of the evolutionary phases that led up to its present state of development, and this reversal of order makes the subject-matter considered in Chapters v, vi, vii, and viii somewhat difficult to grasp. By this criticism, we do not in the least intend to detract from the importance of studying these innovations which to us characterize this edition from its predecessors. The remaining chapters are given over to a description of Food Poisons, Pto-maines, and Leucomaines, and a sober after-thought is expressed in the last chapter on Autogenous Disease.

MARTIN W. WARE.

A TREATISE ON MASSAGE. By DOUGLAS GRAHAM, M.D. Third edition, revised, enlarged, and illustrated. Philadelphia and London: J. B. Lippincott Company, 1902.

Upon perusal of this charmingly written book, we gather from the numerous citations of recent date that the scholarly author has been assiduous in his efforts to bring this treatise up to date. The excellent photographic illustrations aid materially to elucidate the text, in itself very explicit. We most decidedly must take issue, however, with such teaching as applying massage for the relief of intussusception and peritonitis in the acute stage; otherwise, every organ is meted out its due care at the hands of the masseur. But the author, with all his high regard for Labludowski, evidently does not endorse his plan of massage of the testicle and spermatic cord for functional impotence. We fail to find any reference to the common practice of employing massage to effect a reduction of obesity. These are but errors of omission, and in no way minimize the excellence of the judicious advice narrated with the rare grace and elegance of diction to be found in these pages.

MARTIN W. WARE.

MASSAGE AND THE ORIGINAL SWEDISH MOVEMENTS. By KURRE W. OSTROM, of the Royal University of Upsala, Sweden. Fifth edition, revised and enlarged, with 115 illustrations. Philadelphia: P. Blakiston's Son & Co., 1902.

We are assured in its fifth edition that the book has been subjected to entire revision of the text in the light of recent methods. Turning, though, to the matter of fractures, for the immediate treatment of which massage has been exploited by the French surgeons, and its beneficent effect corroborated by other schools, we find advice on this matter to be very meagre, and such remarks as are made are confined merely to the after-treatment of fractures.

The illustrations, remodelled, present in a schematic way,

very successfully, the minutiae of the various movements in the execution of massage.

The book appeals more particularly to students of massage, nurses, and physicians who would be alive to the principles of this art.

MARTIN W. WARE.

A MANUAL OF DISSECTION AND PRACTICAL ANATOMY. By W. T. ECKLEY, M.D., and CORINNE B. ECKLEY. Philadelphia and New York: Lea Brothers & Company, 1903.

The authors of this work have taken upon themselves a very difficult task, *i.e.*, the production of a manual of dissection and practical anatomy which at the same time does not claim to be a descriptive anatomy. Founded on the works of Gray and Gerrish, it assumes the possession of one of these by the reader, without which the present volume would be incomplete.

The book is divided into thirty-three chapters, each taking up a different region of the body. At the beginning of each chapter directions are given for the dissection. For the various incisions, the text is copiously supplied with figures and illustrations, to which the reader is referred. Following this there is a description of each structure to be worked out, giving the relations and important anatomical points concerning the same. Many tables are inserted, which make the book of value to one wishing to review anatomy. An especially valuable chapter is that prepared by Dr. De Lee Shaw on the Blood Vascular System, in which he presents in tables all the arteries and veins under the following headings,—name, description, branches, and distribution.

The book is well illustrated, nearly all the illustrations having been taken from the works of Gray and Gerrish.

PAUL M. PILCHER.